agriculture

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MONTHLY

Yearling Roe Deer (doe)

page 305

Brighter future for modern farming

Steel works hard for farm efficiency. Special plant and structures can improve yields, save labour, time, and money. Rapidly erected steel-framed buildings give long service yet adapt to future needs. Shatterproof corrosion-resistant steel sheet roofings and claddings are now available with tough protective colour finishes to suit your farm buildings right down to the ground.

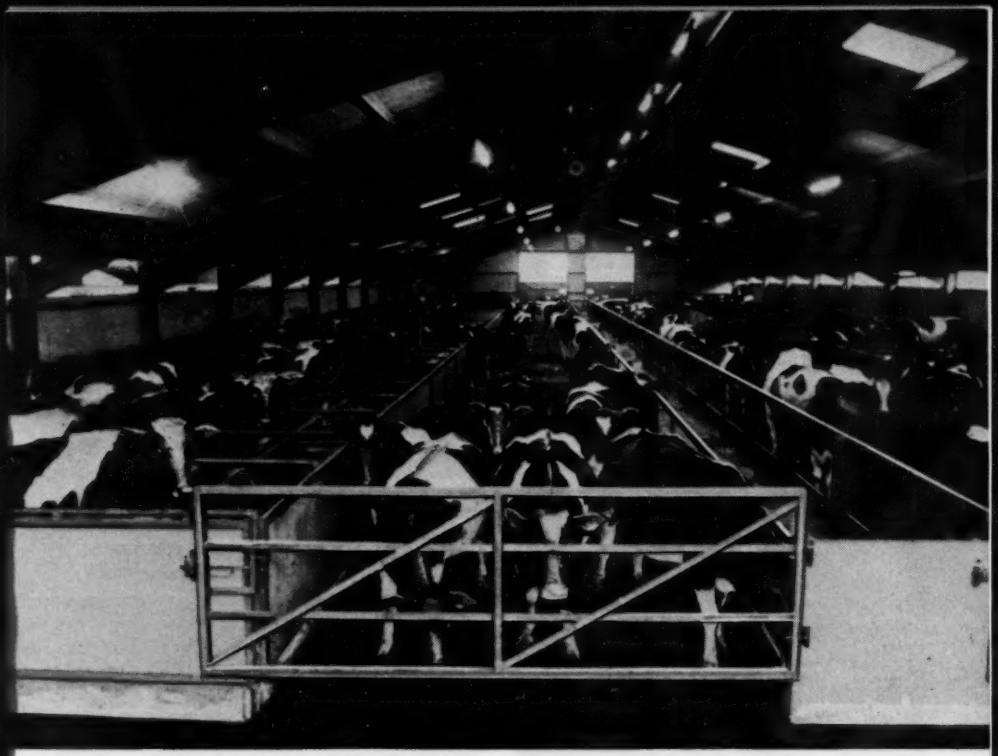
Design for the better in Steel

Steel Sheet: pre-coated for a tough life and a colourful future

Pre-coated steel claddings can give lasting colour and pleasing appearance to agricultural buildings *at low cost*. Plastic-coated 'Everclad' (left), gives a choice of good 'farm' colours. This PVC-coated steel sheet is fully galvanized for effective, long-term corrosion resistance. It provides buildings with a durable colour finish that ensures freedom from maintenance for at least 15 years and is approved for Ministry grant. Prime-painted 'Galvaprime', illustrated below, is another BSC pre-coloured and fully galvanized steel sheet which gives protection cheaply, saving initial site painting. The paint provides an additional barrier against corrosion. Cost is only about ½d per sq. ft. more than plain galvanized sheet.
Steel sheet cladding adds strength and value to buildings. Unlike materials that shatter easily, harbour lichens and fungi and soon become shabby it will long remain attractive.

Colours: 'Everclad' in Lakeland Brown, Peak Grey and Evergreen. 'Galvaprime' in Country Green.

Economically clad 'zero-grazing' unit (above) Horizontal mounting of 'Galvaprime' sheets cut costs. 250-cow unit at ICI's Dairy House Farm. **Low-cost ventilation built in!** 'Ventrex' louvred steel sheet in pre-painted 'Galvaprime'. (Ash & Lacy Ltd., Warley, Worcs.)



Modern structural steelwork builds farm efficiency

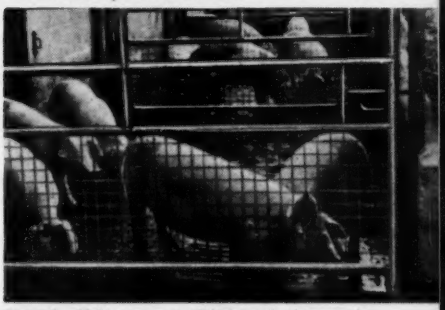
Steel framed farm buildings possess strength, resilience and durability, yet they can be adapted to meet changing needs more easily than structures in other materials.

Much wider clear spans and longer bays can be provided at economic cost. Pre-fabricated steel members are easily handled without fear of damage. Erection is faster and more convenient.

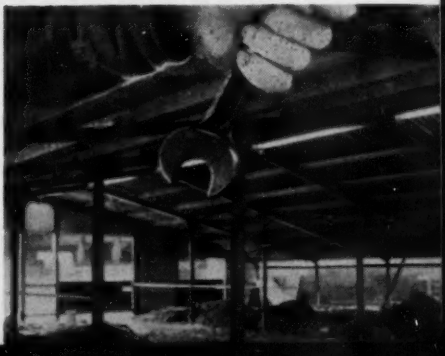
Modern anti-corrosion techniques, including galvanizing of steel frame components, help to eliminate or greatly reduce maintenance.

The economical steel portal frame building shown above is part of a 300-cow 'Cotel' erected by Hill Construction Co. (Engineers) Ltd., Southampton, Hants. Such wide-span buildings give unobstructed headroom and freedom from internal supports, with low structural weight and costs. Clear spans up to 120 ft and above are not unusual. Right: Steel buildings and equipment permit improved hygiene and cleanliness which cut disease and livestock losses. Being non-porous steel surfaces neither encourage natural growths nor harbour bacteria, and can always be quickly and easily washed down and disinfected.

Sturdy tubular steel pig penning and half-mesh gates illustrated are by Gush & Dent Ltd., Alresford, Hants. Pens and gates for the 'Cotel' are by FarmPak Ltd.

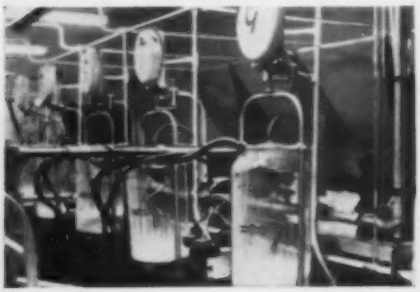


Low building costs. Light tubular steel livestock building based on assembly of easily handled steel components. Farm labour can often erect buildings with a spanner. (Building by FarmPak Ltd., Southampton, Hants.)



Stainless Steel equipment makes light work in the dairy

A wise investment. Dairy equipment in stainless steel aids efficiency and hygiene. Milking machinery speeds work in the labour-saving parlour. Milk lines are robust, damage-free and conveniently cleaned 'in place'. Rapid cleaning of all stainless steel equipment, cuts time and work.
The refrigerated bulk milk tank in high-grade polished stainless steel, with collection by stainless steel road tanker, now eliminates wasted time and effort in handling and cleaning individual churns. Cost-saving 'conversion kits' for quick installation of new stainless steel milk-line systems are now readily available. (Bulk Tank, and parlour system with Electromatic Yield Feeder by Gascoignes).

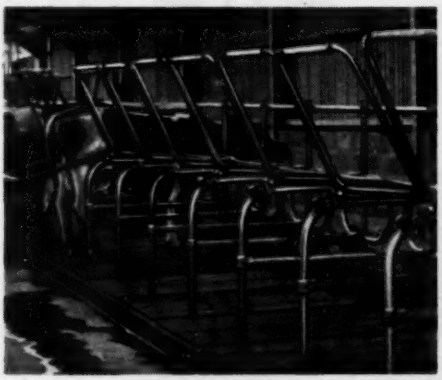


'Push Button' silo machinery saves farm labour

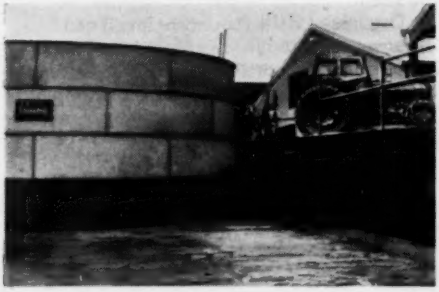
Sealed tower silos in vitreous enamelled steel sheet maintain the moisture content and nutrient value of mechanically-fed forage material. Units for silage and grain have tough acid-resistant finish inside and out which eliminates maintenance. Efficient, labour-saving livestock-feeding and grain storage are achieved here with silos by Howard Harvestore Products Ltd., Harleston, Norfolk, and Boythorpe Cropstores Ltd., Weaverthorpe, Nr. Malton, East Yorks.

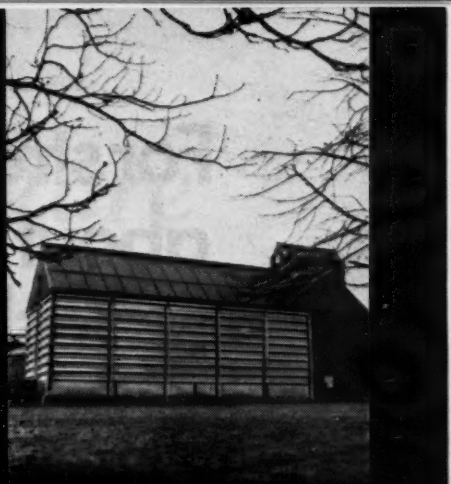
Easier work with few hands

Tip-top 'Cow Traps' in economical steel tube. This labour-saving system employing galvanized steel tube 'Cow Traps' has permitted an increase in herd size with single-handed operation. Better herd management and less supervision are also useful advantages of this installation at a Welsh hill farm. Sixty 'Cow Traps' are installed in this 35-ft span 135-ft long steel frame building. Individual traps close automatically as each animal reaches forward to feed. While in the traps cows remain quiet and comfortable, have ample room to lie down. The system requires 20 per cent less floor area than any equivalent conventional cow cubicle installation. Equipment by Gascoignes (Reading) Ltd., Reading, Berks. Galvanized steel frame building by Phillips Buildings, Hereford.



Labour saving slurry disposal. Steel saves time and labour on this laborious job. Compact above-ground tanks like this 'Braby' unit qualify for full 30 per cent grant. Disposal is a quick, simple mechanised task. Why choose steel? The galvanized corrosion-resistant steel sheet sections are quickly bolted together; cost is low and erection a matter of hours. *Cheaper and more flexible than pit construction.* (Fredk. Braby & Co. Ltd., Bristol).





'Automatic' granaries. In-bin ventilated silos provide the most efficient method of grain drying and storage. 'Square' bins of unit construction make maximum use of space. Standard galvanized pressed steel panels are quickly erected. Bin 'banks' can be economically extended. 'Airsweep' self-emptying floor is powered by the drying fan in this roofed unit built and equipped by Simplex of Cambridge Ltd.

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Agriculture

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MIDAS

the top barley for the seventies

Placed at the top of the N.I.A.B. Recommended List of spring cereals for 1970, Midas has the outstanding combination of characters which make it the barley for the Seventies. High yield, short straw, excellent standing ability, good Mildew resistance and a greater than normal response to nitrogen, together with ease of combining, make Midas the variety for barley growers everywhere.

Midas will be available to farmers for sowing in spring 1971 through specially licensed merchants.

AGRICULTURE JULY 1970

Study of work methods, times for jobs and their organization is a vital part of management today

WORK STUDY IN AGRICULTURE

L. M. PARSONS, B.SC.(AGRIC.), F.L.A.S.

Land Commissioner, Agricultural Land Service

THE pastoral life of our nomadic ancestors of the remote past doubtless handed on to us that antipathy to hard mental or physical work which is inherent in us all. But there must always have been those who consciously or unconsciously took a rather more special look at the process we call 'work'. Whether they wanted an easier life, more income, more goods or greater power, it is not possible to say. Those who built Stonehenge or the Pyramids must have been forced to examine very closely the construction work and methods necessary. Leonardo da Vinci certainly made and wrote about a most detailed study of times and methods for shovelling earth for various engineering purposes. The real use of work study in industry, however, began in America about a hundred years ago, and quickly arrived in Britain where it has had a rather chequered career. It has now attained complete acceptance and is an essential part of the industrial scene all over the world.

A reducing labour force has made farmers pay more attention to labour productivity and, therefore, to find out more accurately and exactly how much labour and time is required for farming operations. Successful farmers probably owe their success as much to their skill in estimating these standards of performance as to their knowledge of the technical processes of production. They would not be so successful if the jobs were not done in the best possible way with the least effort by the men they employ.

Mechanization

Of course, great advances in mechanization have enabled us to dispense with much of the physical work and drudgery traditionally associated with

many farm tasks. Nevertheless, there are many farm jobs which still have to be done by hand and which, if closely examined, bear a striking resemblance to the hard labour of Victorian times. Even some of those done by machinery have created more work than they have saved simply because they have transferred necessary manual or supervisory tasks from one place in the chain to another.

Efficient use of labour

Between the Great Wars, W. R. Dunlop in 1927–28 examined many common agricultural jobs, and was able to effect startling increases in productivity by making, what seemed to him, commonsense improvements in methods and organization. He strongly urged the need for scientific examination of methods and times, fatigue and output measurements. In fact, he was moved to say 'The use of human labour in agriculture is ineffective, careless and wasteful'. Some of his criticism is probably just as valid today. Almost everyone is familiar with the wide ranges of efficiency in, say, milking cows, littering yards, feeding pigs, or the practical difficulties that can arise when new or adapted buildings are brought into use. Unfortunately very few people took any notice of Dunlop, and it was not until well after the 1939–45 war that any real interest revived in the scientific study of farm work and its methods. The introduction of modern farm management techniques—the processes used for farm diagnosis and the analysis and preparation of plans for reorganization—has rightly caught the imagination of those engaged in agriculture and horticulture. Yet, paradoxically enough, many of these newer ideas depend very largely upon the proper use of labour. In fact, the more efficient use of labour can be said to be an increasingly dominant factor of production in modern agriculture.

The larger farmer who employs labour is aware of its high cost and how the efficiency with which it is used can affect the efficiency of all other factors of production. Furthermore, labour is really a wasting asset; it cannot be stored up or saved and it is not always available when required.

Reorganizing or adjusting programmes of production to increase profits depend on labour being able to meet all demands upon it. Therefore, the study of work methods, times for jobs and their organization is a vital part of management and of increasing interest to managers. For the smaller farmer who may not employ or rely upon paid help, they will be of great assistance in making his life easier and in reducing costs and effort.

Yet, with the exception of one or two specialized cases, there has been hardly any general application of Dunlop's fundamental principles since he introduced them fifty years ago. This is a pity, because there are plenty of relatively simple, although modernized, techniques with which to tackle the problems of labour use and human effort. These techniques have their origins in industry. It is probably this fact which has tended to hinder their application in agriculture and horticulture. In the experience of many agricultural work study advisers, where studies have been carried out on farms, both farmers and workers have enthusiastically taken up the ideas and keenly sought to be knowledgeable and critical of the work they have to do.

Definition of work study

The term 'work study'—the study of human work and effort in all its various aspects—is well known. It is not always so generally realized that it

is not, and indeed never can be, a substitute for knowledge and experience; it is merely one way in which all human attributes and skill can be employed to the best advantage. It has evolved a very long way indeed from the old limited concept of 'time and motion'. Most people still think work study means simply making them work harder and harder, quicker and quicker, for less and less reward. But it's aim is to eliminate worthless effort, to ensure that people are employed solely on productive and profitable work and in congenial conditons. In this way work study, properly applied, will help to get rid of heavy physical strains and stresses, unnecessary work and poor conditions, to the well being of all those engaged on the land.

Work study is a set of principles and techniques used to increase the efficiency of work, to reduce costs and to make farm work easier. Of course timeliness matters very much with any farm job and, therefore, time is inevitably bound up with method. Together these two affect most of the labour inputs in farming. There is no need to define time in split-seconds, but something more accurate than man-days or in some cases man-hours might make a difference between success and failure in some enterprises. One of a farmer's main jobs is to select the correct efficient production techniques for his chosen enterprises and then to make decisions on how to organize them. He may require better machines, better buildings or labour saving methods, but he still needs to know how long any job ought to take. The smaller farmer dependent on his own labour also needs to know to save time and energy and leave himself more time for more profitable tasks. Work study is the means by which reduction of effort and a better use of time can be achieved.

Whichever way you look at work, better use of labour can always lead to substantial savings of time and, therefore, cost, and there is just as great a waste of human effort on our farms as in industry. This is because, like any other person, a farmer or worker is not very critical of his own work methods and habits and is consequently not often aware of the possibilities of saving time and effort. The application of work study principles overcomes these inherent defects.

Techniques available

Work study embraces a whole range of techniques for evaluating and improving human work. Basically it is an intensified and logical process of thought whereby more exact relationships can be established between people and resources. Given the chance, it could help everyone working on the land. There are many techniques available, all differing to some extent one from the other but all related and inter-acting. There is:

1. *Method study* —which shows how best to do a job.
2. *Time study* —which measures how long a job takes.
3. *Ergonomics* —which aims to find the safest, easiest and physically most advantageous way for a person to do a particular job.

All these techniques have been tested and proved. For example, in dairy farming the growth in herd size and increase in productivity could not possibly have been achieved without some kind of work study. Similarly, the pioneering work of a few advisers on horticultural problems such as strawberry picking, produce packing or lifting bulbs has helped to reduce growers'

costs. Furthermore, building layout and design owes much to the careful study of the operations destined to be carried out in them. Indeed, farming could hardly have reached its present level of efficiency without some form of measurement and evaluation of work and the use of improved methods.

Any farm job anywhere can be studied and examples have often appeared in the pages of this Journal. Farmers can themselves apply some of the methods used to find easier and more effective and economic ways of doing work. By careful study and analysis of what any task involves they can simplify working methods to avoid waste and reduce materials and labour. Advisers are available to explain the principles and their application.

Some of the techniques do require more skill and experience but the use of *Time Study* need not be confined to collecting data for farm management purposes; it could be used for testing new concepts and ideas. Research into labour use would enable farm work to be broken down into 'elements' or 'building blocks'. If these were measured and the best way of performing them devised, they could be used to build up improved patterns of production. They would have to be tested on the farm, some by using models for *Operational Research* before being put into practice.

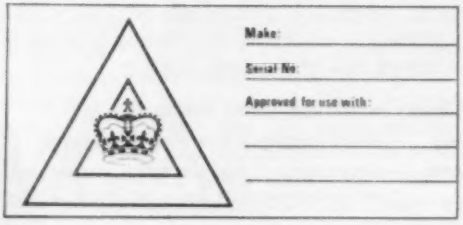
The skills and techniques to do all these things are available; they have been thoroughly tested in farm conditions and they have shown enormous potential. A better way of doing a job, better working conditions, better equipment, better utilization of all resources to do a better production job is both attractive and possible.

FARM SAFETY

Tractor Cabs

On 1st September 1970, the provisions of the Agriculture (Tractor Cabs) Regulations 1967 come into force. From that date wheeled tractors must, when they are first sold for use in agriculture, be fitted with safety cabs approved by the Agricultural Ministers.

Approved safety cabs must display an approval mark, the serial number of the cab, and the make and model of the tractor or tractors for which it is approved, on the following lines:



Not to Scale

Full details are given in the booklet *Farm Safety: Guide to the Safety, Health and Welfare Act and Regulations*, copies of which may be obtained free of charge from local Divisional Offices of the Ministry, or from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex HA5 2DT.

A description of deer control measures on a former Royal hunting preserve

Cranborne Chase

A Fallow buck

R. F. Hickes

CRANBORNE Chase follows the line of the chalk downs north-eastwards from Blandford in Dorset to just over the Wiltshire border. The area extends westwards as far as Shaftesbury and eastwards to the Salisbury to Blandford road.

Today the Chase shows little resemblance to the Royal hunting preserve of former times. Much of the forest has been cleared for agricultural crops, but it is estimated that about 600 Roe and 200 Fallow deer still live in the Cranborne Chase. The management of the woodlands, both by the Forestry Commission and private land owners, became increasingly intensive and the mixture of coniferous and deciduous forest trees gives an ideal habitat for deer.

The first five years of a new plantation are critical and both the Roe and the Fallow are responsible for the damage to young trees. But it is largely the Fallow living on the periphery of the woodlands that are seen more frequently on the adjoining farmland and cause the bulk of the damage to farm crops, particularly the early bite in the spring.

Organized control

Disease, predation of fawns by foxes and killing by car account for a fair number of deer annually; it is only in recent years, however, that organized efforts have been made to control the deer in this area. Deer drives used to be fairly common, but they tended to aggravate the situation as the deer were disturbed and driven to areas where they had previously not been found. Many were only injured and the few killed certainly did not keep pace with the annual herd increase.

The greatest step forward in control was the formation of the Cranborne Chase Deer Control Society in 1964 at the suggestion of the Forestry Commission. The Society, under the aegis of the British Deer Society, attempts to marry the various interests of farmers, foresters, sportsmen and preservationists. The Ministry of Agriculture is represented by an observer, and a dozen members give full co-operation; others on the fringe of the area co-operate loosely but do not follow a deer management plan as part of the Society Scheme. About 6,000 acres are managed at present, but as the Society expands to cover the larger part of the Chase woodlands a more effective deer control will be possible.

Skilled stalkers are recruited from local estates and from outside; two of the present five are professionals. Ideally, every wooded area in the district should be covered but more stalkers, who mostly receive nothing for their efforts and do this work in their spare time, would be needed.

Before controlled methods were introduced it was considered that the Roe deer were at saturation density, as many as the available food supply and cover would support. In 1962 this was about one deer to ten acres; by 1969, in those areas under effective control, this had been reduced to about one to fifteen acres. Saturation resulted in dispersal outwards and the colonization of new areas; also the filling up quickly of the few areas where some culling was carried out.

Stocktaking

With planned culling it is necessary to carry out an annual census of the deer population. This is done by the stalkers. As the deer are not enclosed and there is an inward and outward flow of deer in the area, it follows that this visual stocktaking cannot be very accurate. But if the same system is followed annually at least the error will be consistent, and there will be some guide to the change in population. The optimum time for the census is in March and April; the close season for does starts on 1st March, visibility in the woods is still good, and the deer are feeding more and more by day as the nights shorten. Only the bucks are counted, the total being multiplied by the estimated

Young Roe kid in the New Forest

sex ratio. When indiscriminate shooting was practised there was little balance between does and bucks; with planned culling it is aimed to maintain a 1 : 1 sex ratio amongst the Roe. With a large area where the stalkers are not thick on the ground, the census is carried out on a representative block and then adjusted to represent the whole area. The usual signs of occupation, e.g., browsing, fraying, bark stripping, scrapes, droppings and slots (tracks) serve as a guide to stalkers.

There is considerable movement of deer as between winter and summer. In winter the cover is less and they form small parties concentrated in a small area, although shortage of food will mean some movement. In summer the territorial aggression of the bucks leads to greater dispersal. If the main woods become saturated, the yearlings and older bucks tend to move to outlying coppices. There is also the movement created by man's interference in the form of grubbing out of old sections of the forest.

Culling

There exists in this area the usual conflict between those who think of deer as vermin and those who regard them as an asset and a desirable addition to the fauna. All agree that control is essential; the difference is one of method and extent and the Society is intent on reconciling the opposing views. In the few years that the Society has been operating it is estimated that Fallow have been reduced from 300 to 200. Roe have been controlled at a little below their original number, i.e., the cull has just about kept pace with the natural increase and outward dispersal has been checked.

The culling of Roe bucks is concentrated in the summer months; it includes mostly young bucks and those that are old, diseased and injured, the prime bucks being left. The plan is to maintain the bucks at a number where the fraying damage is small and territories are held by powerful individual bucks. If there are too many bucks in relation to does, fraying damage will result from the competition for the does. In this respect it is important that fraying damage be reported immediately; if it has resulted from two bucks disputing territory, then the killing of one buck will stop the damage. At the time of the rut (July) the aim is to have slightly fewer bucks than does.

The does are culled during the winter and this is more difficult due to the shorter days and because the hours of daylight when few people are in the woods are severely limited. It is difficult to differentiate between the Roe doe and buck until the latter is in velvet in later winter. Selection between different ages is hardly possible and the aim is to remove the number of does necessary to bring the sex ratio to 1 : 1. It must be appreciated that the Roe is a family deer and the Fallow a herd animal; whilst it is practical to maintain the Roe at 1 : 1 the aim will be to maintain the Fallow at 1 : 2 or more.

Close liaison is necessary between the stalker and the various interests, but it is appreciated that stalking interests are secondary to the farming and forestry interests. The culling plan that results from the census is carried out by the end of February; the stalker will then be ready for the next census in early April. As each deer is shot, a card is sent by the stalker to the Secretary of the Society so that the progress of the cull can be followed. During the cull the floating yearling bucks are taken first before they disperse; the older, diseased and injured bucks are taken before the rut. Elusive Roe bucks earmarked for culling are collected by 'calling' during the rut.

'Taking it Easy'

Today the stalker will invariably use a rifle with a telescopic sight. Although the theoretical range from a high seat is over 200 yards, in practice nothing much over 150 yards is taken. The high seats can be portable or permanent; they must be sited so that the approach can be from several directions according to the wind. In thick areas it may be necessary to have some parts cleared so that the stalker can operate.

Damage

With the selective culling of bucks, fraying damage has been greatly diminished, but browsing damage is more of a headache. This can be lessened by silviculture management techniques, e.g., when weeding a young plantation it may be advisable not to weed so severely that there is nothing left for the deer to eat but young trees. Brambles absorb some of the browsing damage. Chemical control of weeds in a new plantation is certainly efficient, but it does make the young trees more vulnerable to browsing damage. The size and shape of new plantations will affect browsing damage: long narrow blocks, for instance, are more vulnerable than large square blocks; they give a feeling of greater security to the deer which do not have to stray so far from the thick cover of adjoining older plantations.

The right of the occupier of farm land to shoot deer doing damage to his crops cannot be accepted literally. It might be supposed that he would be entitled to take action under the Deer Act of 1963. It would appear, however, that the Deer Act does not confer a right to kill and take deer where none existed before, and in many cases the tenancy agreement specifically reserves the sporting rights to the landlord. It should be noted that sporting rights traditionally include deer whereas shooting rights do not.

Deer fences are not practicable on a large scale, but for householders in isolated areas wishing to preserve garden crops they are desirable. An electric fence for keeping deer off early grass has not proved very efficient, the wire usually finishes up in an awful mess. One landlord is now carrying out experiments with clearing sections of woodland and putting down special feed areas of grass, the aim being to keep the deer in the forest and away from the farmland. This is designed for the Fallow deer and it is too early to say whether this is going to be successful.

The future

The Society is keen to encourage interest and co-operation from farmers who, although not having large woodland areas on their farms, do have small coppices and scrub areas in which deer live.

Although there are imperfections in this local Deer Control Society it is increasing in efficiency. The following figures indicate the increase in cull:

Year	Roe	Fallow
1964/65	109	24
1965/66	147	41
1966/67	143	68
1967/68	187	110
1968/69	215	94

With the decrease in the number of Fallow, one snag has arisen in that the Roe have less competition and the danger arises of a greater potential survival rate. There can obviously be no let up in the cull figure for some years yet and a further increase in the Roe cull will be necessary to bring about a reduction in the breeding herd.

This society has been designed to suit the particular problems, both deer and human, that exist in this area. It does not follow that this sort of management would be applicable to every area where deer control is desirable. I should emphasize that methods of control have to be modified to suit each species of deer.

The Society has had the benefit from the outset of the services of the Forestry Commission's Head Ranger, Mr. Richard Prior, who is also the Society's 'Damage Registrar' (to whom foresters and farmers can report damage by deer) for Dorset. He has made an intensive study of Roe deer in the course of his duties since 1962 and recently published his findings in book form.*

This article has been contributed by **R. F. Hickes** who is a Field Officer with the Ministry's Divisional office at Taunton.

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*PRIOR, R. (1969). *The Roe Deer of Cranborne Chase*. Oxford University Press. 50*s*.

Brucellosis

New Act Makes it an Offence to Sell Reactors (Other than for Slaughter)

Under the Agriculture Act 1970, which received the Royal Assent on 29th May 1970, it is an offence for any person to sell, except for slaughter, an animal known to him to be a reactor to brucella abortus. This offence carries a penalty of a fine up to £400 (or, if committed with respect to more than 10 animals, not exceeding £50 per animal).

Systemic Fungicides

R. Eric Taylor

WITH the advent of systemic fungicides, we are now entering a new era in the control of plant diseases.

Until recently chemical combat of foliar diseases has depended on the use of protectant fungicides, some of which have eradicant properties. For success as a protectant the fungicide must be applied in anticipation of infection. If, however, it is able to penetrate the leaf tissues, although only to a limited extent, it may kill the fungus after infection has taken place; for this eradicant action to be effective it is usually essential that the fungicide be applied as soon as possible after the infection has taken place.

Although systemic insecticides have been in common use for many years, it is only recently that any systemic fungicide with commercial promise has been found. Since about 1964, a number of unrelated compounds have been found and more are being produced each year.

Properties and requirements

Usually the term systemic is applied to a substance if, when it is applied to the roots or leaves of a plant, it is absorbed and exerts an effect at a distance from the point of application. This, however, is a very loose interpretation, for there is a wide variation in the degree to which this occurs, often related to the way in which the plant tissues react to the presence of the substance and the form in which it is moved within the plant. The material may, if applied to the roots, be absorbed and carried to all parts of the plant. On the other hand, if applied to the foliage it may readily be transferred to other parts or it may have only limited movement within the leaf. In any event, movement more readily occurs upwards from the roots than downwards from the leaves.

As with an insecticide, a systemic fungicide must fulfil several conditions. It must be non-toxic to the plant at the dosage required for control of the disease; it must be capable of being applied to the plant in a form in which it can readily be absorbed by the roots or by the foliage and be moved within the plant to the site of the disease. It must not be inactivated within the plant before it can reach the fungus and, if it is used as a seed treatment, it must not be inactivated by the soil. It must also remain active for a prolonged period to minimize the need for re-application.

The prospects

A chance observation in 1964 showed that a benzimidazole derivative, thiabendazole, an active ingredient in a worm drench in veterinary use, had fungicidal activity and was, moreover, systemic in plants. Its uses so far have mainly been in horticulture and a proprietary experimental formulation for horticultural use is 'Tecto 60'. Commercial application in Britain is at present the subject of trials on a variety of crops, but the material is not yet commercially available. Thiabendazole has been shown to be active against a wide range of fungi pathogenic to plants and to many of the fungi causing post-harvest rots of fruit. Recent N.A.A.S. research work has shown that it can be used with encouraging results against Verticillium wilt in carnations, applied as a soil drench to the affected area and the area immediately surrounding it.

Oxycarboxin and carboxin are two closely related oxathiin compounds. These are the active ingredients in 'Plantvax' and 'Vitavax' respectively marketed commercially in the U.S.A. Oxycarboxin is specifically active against the rust diseases while carboxin is effective in the control of loose smuts of wheat, barley and oats. The latter is marketed in Britain as 'Murganic RPB' which contains 55 per cent of the active ingredient carboxin together with one per cent of an organomercury compound. Oxycarboxin is not yet available commercially in Britain.

A more recent introduction (1967) is the systemic fungicide benomyl, another derivative of benzimidazole, marketed as 'Benlate'. Promising control has been achieved over many cereal diseases by foliar applications and by seed treatment; these include mildew, the smuts, species of *Septoria* and *Fusarium*, eyespot and *Rhynchosporium*. There appears to have been no effect on the stripe diseases of barley and oats and little effect on the cereal rusts. Among diseases of other agricultural crops there is evidence that control has been obtained over skin spot of potatoes and some effect also on gangrene. As yet the material is not marketed for crops other than apples and pears. It has wide application in horticulture and has been shown to be active against *Verticillium* and *Fusarium* diseases of chrysanthemums, carnations tomatoes and cucumbers, *Botrytis* on a wide range of hosts including lettuce and strawberries, and scab and mildew on apples.

Benomyl as 'Benlate' can be used on any non-edible crop; and on any growing edible crop subject to a minimum interval of seven days between the last application and harvest.

Systemic and fungicidal properties have also been discovered in a group of pyrimidines among which ethirimol, the active ingredient of 'Milstem', is being developed for the control of powdery mildew on cereals. It can be applied as a foliar spray and development work is in progress to determine the most convenient and effective way in which it can be applied to the soil—as a seed treatment or as a granule. The material has been recommended for commercial use on cereals.

Dimethirimol, marketed as 'Milcurb', is especially active against powdery mildew on cucumbers and related crops. Applied to the soil it is fully systemic, spreading throughout the plant. It is both protectant and eradicant. It also has considerable activity against powdery mildews of chrysanthemum and cineraria; on such woody plants as rose, apple and pear it has some activity against mildew but it is of limited effectiveness.

Two closely related systemic fungicides that, in extensive trials in Germany, have shown good control over powdery mildew of barley are dodemorph (formerly cyclomorph) and tridemorph. The latter is available now in Britain marketed as 'Calixin' containing 75 per cent of active ingredient. Besides conferring protection against mildew there is evidence that it has an eradicant effect on already-established infection.

Two other systemic fungicides in their development stages that should be recorded are under the code names 'EL 273' and 'Cela W525'. The former is a broad-spectrum fungicide with activity against powdery mildew and yellow rust of wheat, but it is only locally systemic in that there is only limited movement within the leaf. The latter, 'Cela W525' also has activity against cereal mildew and can be applied as a seed treatment in which circumstance it is systemic. As a foliar spray, however, it is not systemic. Additionally, both are said to be active against powdery mildew on apples, cucurbits and ornamental plants and against the cereal rusts and apple scab.

Further experimental systemic fungicides are thiophanate derivatives and mebenil; the former are active against cereal mildew, cucumber mildew and apple and pear scab; the latter more especially active against the rust fungi.

Products commercially available in 1970

Benomyl (*as* '*Benlate*'): for use on apples and pears, at rates up to 1 lb/acre costing 82*s.* 6*d.* per pound (approx.).

Carboxin (*as* '*Murgannic RPB*'): a seed treatment for controlling loose smuts in barley and wheat. Rate of application 4 oz/cwt costing about 27*s.* 6*d.* per cwt.

Dimethirimol (*as* '*Milcurb*'): for soil or foliar application against powdery mildew on cucumbers and pot-grown chrysanthemum and anemones.

Tridemorph (*as* '*Calixin*'): a foliar spray for controlling powdery mildew in spring barley. Rate of application ½ pint per acre in not less than 25 gallons spray costing 22*s.* per acre. This can be applied with many of the commonly-used herbicides. For best effect it should not be applied before the crop is fully tillered.

This article has been contributed by **R. E. Taylor, B.Sc.(Agric.), Ph.D.** who is the Regional Plant Pathologist for the N.A.A.S. in the South Eastern Region.

Experimental Husbandry Farms and Experimental Horticulture Stations

The series of articles from the Ministry's Experimental Husbandry Farms and Experimental Horticulture Stations will continue in 'Agriculture' throughout the year.

Among the subjects it is hoped to cover are:

Flower bulb production
Winter feeding beef cows
Winter lettuce
Cereals on sand land
Drainage studies on lias soils
Field vegetable production
Potatoes in wide rows
Plastics for crop protection
The tick problem
Mechanical harvesting of fruit
Living shelter
Anemones
Continuous winter wheat

This article describes an experiment that has been set up to ascertain ways of improving and maintaining the appearance of the Ullswater area frequented by visitors

An Experiment in Upland Management

John Baily

EARLY in August 1968, a paper from the Countryside Commission, headed 'Experimental Project on Mountain land Management', arrived on my desk with a request for information about farms and land on the east and south sides of Ullswater. The paper said the Commission were hoping to set up an experiment in a mountain area frequented by visitors either in North Wales or in the Lake District, to ascertain whether farmers could and would undertake small jobs such as improvements to paths, removal of litter, improvement and maintenance of the appearance of the area. A project leader would be appointed to arrange what jobs should be done, pay for them, and make detailed progress reports. The Commission had discussed their idea with the Agricultural Land Service of the Ministry of Agriculture, and there was a suggestion that if the experiment went ahead the A.L.S. would provide the project leader.

Before 1939, I had lived in Patterdale at the head of Ullswater for eight years. Since 1946 as an A.L.S. officer in Carlisle I became acquainted with the area and all the hill grant schemes (starting with the Hill Farming Act 1946), first in Cumberland, Westmorland and Durham, later mainly in Cumberland. I also knew just how much information there was in the Divisional Office so that in a couple of days I was able to put most of the information required on paper and return it to the Countryside Commission. I decided that if the experiment went ahead it would be in Wales, and settled down to routine work in West Cumberland, with the occasional day dreams about Martindale and Patterdale.

Appointment of project leader

For some months I had heard nothing; then in February 1969 I was summoned to a meeting in London to hear in great excitement not only that the experiment was 'on' in both Wales and the Lake District, but that I was to be the part-time project leader for the Lakes area. After the meeting in London, two of the Commission's Research Officers visited Carlisle, and we spent a long day driving round Howtown, Martindale and Patterdale. Finally, it was decided to include rather more of Patterdale, making the boundary the Ullswater watershed, from a point near Pooley Bridge to the top of Helvellyn and down Striding Edge back to the lake.

Having lived and worked for most of my life in or near the Lake District, and knowing something of the problems of hill farming and tourism in the lakes, I was delighted to have the chance of taking part in an experiment that would help both farmers and visitors. I was also greatly encouraged by the members of the Countryside Commission staff who had planned the experiment and done all the ground work necessary to get it started; I have rarely met such a combination of open-mindedness, vision and practicality, or such an 'eye' for the country. In comparison, I sometimes felt myself to be a slow-witted amateur.

Publicizing the experiment

All this time the experiment was highly confidential; obviously it was not desirable to give any hint of it, partly in case it did not go ahead, and partly to ensure that if it did everyone concerned could be given full information on it at the same time. By August of last year, however, it seemed that all the loose ends had at last been tied up, and a final meeting was arranged to check details and arrangements for publicity. Having done all this, we discussed what the official starting date should be; September or October was suggested but I firmly said 'tomorrow' and won the day.

A hectic week-end (and more) followed, getting out information sheets about the project to owners, agents, farmers, local authorities, and as many bodies connected with recreation as I could find addresses for in the telephone book. Then follow-up visits, starting with local authorities, the National Trust, owners and owner-occupiers; tenant farmers were left until the owners concerned agreed to my visiting them. Some people naturally had doubts and reservations about the experiment, some welcomed it; but generally all were interested, helpful and co-operative.

As well as the work entailed by the experiment, I have also been given the additional responsibility for all A.L.S. work in the area as the two combine naturally. This means that a single visit may concern Hill Land Improvement Schemes for fences, roads etc., and discussion of 'experiment' jobs, such as putting in wickets or stiles beside new gates in the hope that visitors will not leave farm gates open.

Marking maps

One of the first jobs under the experiment was to mark a set of 6-inch sheets with rights of way. Most week-ends throughout the year my wife and I have spent at least one day somewhere in the Lake District, pottering about, finding odd corners, scrambling up becks and sometimes even walking along paths; now these outings are usually somewhere around Ullswater, exploring paths and thinking of improvements that could be made to them. With a 6-inch sheet, and a good deal of experience in map reading, we usually know our position. However, one day, after following a track along the fell side that is not a right of way, we reached a point where the map showed a footpath up the fell; we descended safely, partly through the bracken, and partly down what looked (and felt) like a stream bed, and had to climb over a gate to get on to a farm road at the foot of the fell. No doubt it was once used, but the gate looked as if it had not been opened for twenty years. Signposting is a problem. Some paths are signposted but in many places there is no indication at all of where footpaths and bridle ways start and finish; in fact, with some it is practically impossible to trace their whole distance. Some people want much more signposting and marking of tracks to

be done, so that walkers will be encouraged to keep out of fields; others do not, partly because it will encourage too many people to follow paths and partly because anyone with a 1-inch map marked with rights of way should be able to find them.

Litter

Litter is a headache but no one knows what to do about it. There is any quantity of it in various places (draw your car into any lay-by on a Lake District road, and look over the wall). One school of thought says that if there are no litter baskets, people will take their litter home with them. Another, including those who look over walls at lay-by's, think that if there are no receptacles, litter is at least disposed of out of sight if thrown behind walls, into hay fields, or in hedge bottoms; the immediate effect is not visible, but the 'evidence' re-appears when sheep get their noses into discarded tins and farmers start mowing fields. If there are to be litter bins, they must be emptied often, and this is something the experiment may allow for. However, this raises the problem of disposal of the litter. Local authorities, who are responsible for the collecting of household refuse are handicapped by the lack of good disposal sites, and although the inhabitants of an area are all for a good refuse disposal service, they are less enthusiastic when asked to provide land for refuse tips. This can be shortsighted, because a local authority refuse tip is controlled, covered with soil as tipping goes on and carefully sealed and usually grassed over when it is finished with. The solution to the litter problem is 'take it home' and an extension of the attitude towards paper that every piece has its proper place, even if it is only in the waste paper basket.

Publicity

One aim of the experiment, incidentally, is to reduce paperwork, at least so far as dealings with farmers are concerned. However, paper may be needed later on if present ideas for 'hand-outs' to visitors materialize as anticipated. It is not enough just to say 'shut the gate' or to ask people not to knock walls down, unless they understand why sheep stop on one side of a wall or gate rather than the other; and how much do visitors really know about sheep and their habits anyway? Perhaps a suggestion that Swaledales have a knowing look proper to inhabitants of Yorkshire whereas Herdwicks have a rather simpler look, more like Cumbrians (being a Cumbrian myself, I can assure others that neither the two-legged nor the four-legged variety are quite as simple as they look), may help to make visitors more interested in sheep and to see the point of shutting gates.

What next?

So far, the word has now been passed to all concerned and it is hoped that the experiment is being given thought; and the next stage of actually getting work done and paying for it is starting. So, if readers are around Ullswater in the next few months, and meet a harassed looking man carrying a sack full of litter, a small bag of gold, a camera, a bundle of maps, and a pocket full of Farm Improvement and Hill Land Improvement Scheme forms, you will know that it is just the project leader of the Upland Management Experiment, out for an afternoon's stroll.

This article has been contributed by **John Baily, A.R.I.C.S.**, a Senior Agricultural Land Commissioner with the Agricultural Land Service in the Ministry's Carlisle Divisional Office.

An ideal game habitat, different crops, hedgerows and belts

Nature Conservation and Agriculture

J. M. Way

WE live in exciting and changing times. Also at a time of great responsibility to see that the changes we make are not detrimental to the quality of the environment we hand on to future generations.

The quality of the British countryside, as a product created by Man over many generations, is as high as anywhere in the world. Few other countries, if any, have in so comparatively small an area such a range and diversity of land forms and land use. The pattern of the British landscape is truly unique and is entrenched in tradition, the roots of the people and their history. Nevertheless, it is a fragile thing and can be spoiled for short-term advantage, not necessarily as a result of individual greed or irresponsibility, but because of social and economic pressures. Change is inevitable and changes in agriculture have been taking place ever since Man first started cultivating the land. We cannot prevent change, but we can and must direct it.

How are the changes that are occurring so different from those that occurred before? This is probably a question of time, scale of operations, social demands and expanding technology. The change from muscle power, men and horses, to tractor power has probably been responsible for a more complete revolution in the use of land than has occurred in so short a time at any period before.

Planning for the future

Superimposed on agricultural changes are changes of other kinds; some in scale with the landscape so that sooner or later they will be assimilated into it, and some altogether out of scale such as huge pylons, mineral workings and many urban and industrial developments. If we are concerned that we are going to hand on to future generations as good an environment as we inherited, then we do have to plan for it now, otherwise events will overtake us. No longer can we have landscape and wildlife as a casual by-product of other land uses: we have to take actual positive steps to plan for them. And we have to be realistic about this by being positive rather than negative. Thus it is a negative thing to say to a farmer 'Do not pull out your hedges' when every economic advantage to him points the other way. What we have to do is to work out economic field sizes in relation to the performance of farm machinery, as a result suggest to farmers which hedges ought to be sacrificed, and then encourage them by economic or any other means to conserve the remainder.

What is conservation?

Conservation is a word that is currently in fashion, and there is some danger that the general public will become bored before they understand the issues at stake. For many people conservation means maintaining the *status quo:* not removing a tree or draining a pond to which they have become accustomed, not pulling down an old building, or altering a landscape by building a road across it. But this also is a negative approach because the tree will grow old and die, the pond silt up, the old building crumble and the road, inevitably, must be built. Conservation should be a dynamic concept calling for imagination and knowledge, art and science, together with a willingness to pay. A realization that all things will change, but that it is only how they change that matters. Conservation has another meaning also: the husbanding and efficient use of resources for a sustained maximum yield. Good farming is a prime example of conservation. Conservation of the soil, of fertility, of water, by management, based on experience, backed by science, to maximize production of food without exhausting the land. Equally well, river and water authorities are conservationists; so also are foresters, game managers and all those who are concerned with efficient amenity and recreational uses of the land.

Wildlife

Wildlife or Nature conservationists are thus in good company. They are concerned with the conservation of a resource, in their case wild animals and plants. But what kind of a resource are wild animals and plants? How can they be managed to give a sustained maximum yield? The answer must be that the benefits of nature cannot be measured in this way. Except in the case of game there is no regular crop that can be taken. Although efforts are being made to put an economic value on the conservation of wildlife, it is going to be some time before a purchaser will pay more money for ordinary agricultural land because it has a hedge, a pond, a tree or cowslips in a corner of the meadow. Of course, people do pay high prices for land of high amenity value in this way, but generally not if they are farmers having to make a living.

So, if wildlife is a resource that cannot be cropped and is said to have great value but does not fetch a price, why are we so concerned about it? There must be many answers to this question and certainly no unique answer; it is full of intangibles, philosophy, attitudes to life, and yet there are very few people who would argue against the conservation of wildlife. This in itself may be an answer, simply that people feel they want to live in an environment that also contains wild plants and wild animals. A mystical feeling but real, based perhaps on a dim recognition that Man is part of nature and that the further most of us become divorced from contact with nature, the more we need to understand and conserve it. Not that most people have any knowledge or understanding of nature; but this does not prevent them from feeling that they do. This, then, is perhaps the most important reason why a sufficiently large and vocal proportion of the population want wildlife conserved. Certainly for themselves and maybe for their grandchildren.

There are other reasons that are important but more sectional in their interest. The scientific value of wildlife is important because, in spite of our technology, we live in a world governed by natural forces still well beyond our control. Scientifically, we have yet to learn a great deal about the regulating forces that affect the air we breathe, the water we drink, the action of plants, the movement of animals and many other constituents of our environment. The balance of nature is well adjusted and buffered against many potential disasters; but it is a swinging balance, not a static one, and too much of a swing in one direction or another, as with pollution for example, can lead to situations from which there is little or no recovery over long periods. If there is a scientific value in the conservation of wildlife, there is also an educational value. Sophisticated, urban, civilized Man is really Man dependant upon a technology that can fail at any time for mechanical or social reasons. Man as an animal needs to be taught at an early age how dependant he is on nature, in case he forgets how fragile a thing is his technology, based on wasting assets of fossil fuels with no guarantee that the energy sources with which he hopes to replace them will be adequate.

Why farmland?

Farmers, who are concerned with the production of food, may well wonder how they are concerned in conservation. With large areas of upland and marginal land in many of the western and northern parts of the country, the comment is frequently made that the conservation of nature should be concentrated in those places where there is so much less conflict with intensive agricultural production. However, for exactly the reasons that the best land for farming is on deep fertile soils in climatically favoured parts of the country, so also are these areas the best for wildlife. More species of wild animals and plants live in greater numbers in the lowlands. Many, if not most of these species, cannot live in the uplands because they are not adapted to them. If their lowland habitats are destroyed they simply disappear and this really is happening with many plants and animals on a local scale in lowland Britain today. In some instances it will not take very much to change local disappearances into national ones. Places of the highest ecological and wildlife importance do occur in the uplands, and some are National Nature Reserves, but they are important usually because of their uniqueness, because they demonstrate communities of plants and animals

under conditions that cannot be found elsewhere. Because they are unique it has been of highest priority to preserve them from destruction. As much of the effort in conservation in the last twenty years has gone into the protection of these places, wildlife conservation has perhaps gained a reputation of being something best done in wild and remote places. However, in 1970 this is no longer true. We are concerned today with the conservation of wild animals and plants in the places that they occur most frequently, that is in the traditional, lowland farming areas.

Now good farming is conservation and so is the management of land for wildlife. They should have a great deal in common and, no doubt, would if it were not for the economic factor. This, however, is overriding and in so far as we have wildlife on farmland situated in intensively farmed parts of the country, it is because farmers consciously or unconsciously pay for it. This is not entirely altruistic on their part. Where hedges, trees, unpiped ditches, ponds, rough and scrubby areas are deliberately left, this may be for game (which does have a cash value) or because the farmer likes them, or because he feels they may be of some use to him in the future. Unfortunately, present economic policies and pressures on land use are causing more and more farmers to maximize production and now they have the technical ability, machines and chemicals to do it; areas of land are being brought into production that would not even have been considered ten years ago. If we do value wildlife in lowland England, we should either change the economic policies and take the pressure off the farmer, or we should compensate him directly or indirectly to conserve those habitats that are most important.

Change and challenge

The great period of change in the countryside in which we are living presents many challenges to the farmers and to his advisers. But especially to the farmer, who may find that he is expected to manage his land not only for food production, but perhaps also for the conservation of wildlife, the recreation of townspeople and in the interests of the landscape as a whole.

This article has been contributed by **J. M. Way, T.D., M.Sc., Ph.D.**, who is a Principal Scientific Officer in the Toxic Chemicals and Wildlife Division of the Nature Conservancy at Monks Wood Experimental Station. He joined the Conservancy in 1962 after working for eight years at the National Vegetable Research Station.

Rinse out that Container!

The smallest amount of toxic chemical left in a used container can be a real danger to children and animals. If it gets into a ditch or stream it can also poison fish and livestock.

Empty metal or plastic containers should be thoroughly washed out and the washings added to the contents of the spray tank. Returnable containers should be washed out and sent back to the suppliers without delay. Cardboard containers and plastic sheet bags should be emptied completely and these and other combustible containers should be burned. Containers which will not burn should be flattened and buried at least 18 inches deep in an isolated area.

Partly-full containers should be tightly closed and stored in a safe place away from feedingstuffs and out of reach of children and animals.

Pesticides should never be transferred into other containers, especially beer and soft drink bottles.

A. M. Houston of the Agricultural Economics Unit of Exeter University discusses the origin and role of the

Food and Agriculture Organisation

In recent years we have been made more generally aware of the problems arising from our expanding populations. But these problems are not new and people recognized them long before Malthus drew attention to the consequences of the expansion of population exceeding the growth of man's food supplies.

In the later decades of the nineteenth century, the more advanced countries experienced, during a period of rapid economic development, growth in food production due to improved agricultural techniques which were not foreseen by Malthus and the earlier classical economists. However, the increases in economic growth and agricultural productivity have not been world-wide and the old anxieties have returned with a new emphasis. In addition to a concern about the rate of population growth in the world in relation to food supplies, there is a widespread belief that the present rate of population growth in the poorer countries is a serious impediment to their economic progress quite divorced from the question of food supply.

Origins of FAO

Given the long-standing nature of the problem, it is not surprising that the concept of an international agency to assist man's endless fight to provide himself with adequate food is much older than the Food and Agriculture Organisation. Indeed, FAO had its forerunner in the International Institute of Agriculture which was established in Rome before the First World War. The Institute, which was subsequently absorbed by FAO, was more limited in its functions, having been created to collect information relating to such problems as the payment of rural labour and plant diseases and to recommend measures for the protection of common agricultural interests.

The first steps in the formation of FAO were taken in 1943 when President Roosevelt held a conference at Hot Springs, Virginia, to examine the problems of food and agriculture. To a certain extent the Hot Springs Conference followed an earlier initiative on the part of the League of Nations to consider jointly the problems of food consumption and nutrition on the one hand

and, on the other, those of agriculture. The FAO itself, a specialized agency of the United Nations, was established in 1945, with its headquarters initially in Washington and later from 1956, in Rome.

According to its constitution, FAO 'shall promote and, where appropriate, shall recommend national and international action with respect to:

1. scientific, technological, social and economic research relating to nutrition, food and agriculture;
2. the improvement of education and administration relating to nutrition, food and agriculture, and the spread of public knowledge of nutritional and agricultural science and practice;
3. the conservation of natural resources and the adoption of improved methods of agricultural production;
4. the improvement of the processing, marketing and distribution of food and agricultural products;
5. the adoption of policies for the provision of adequate agricultural credit, national and international;
6. the adoption of international policies with respect to agricultural commodity arrangements.'

Role of FAO

The role of FAO is probably best expressed in terms of an all-embracing goal which P. V. Cardon, a former Director-General, declared to be . . . 'enlarging human well-being by increasing and improving the production, distribution and utilization of food and other products of agriculture, forestry and fisheries'. The purpose of FAO is therefore to promote the use of man's technical and scientific knowledge to alleviate the pressure of population growth on the world's food supplies; this has inevitably led to the greater proportion of its time and effort being devoted to the problems of the developing countries. The FAO has attempted to bring to bear on these problems all that science and technology can offer, but at the same time it has recognized the differences between peoples, their backgrounds, their interests in the use of their resources, and their varying ways of life. The FAO has been concerned not simply to impose upon the developing countries of the world the discoveries and methods of the developed countries, but to use the material and human resources at their disposal within their own cultures and environments, which are often very different from those of the more advanced economies in the Western World.

The work of the organization embraces a wide range of subjects (agriculture, economics, forestry, fisheries and nutrition) and falls into four general categories:

1. the collection and dissemination of information relating to food, agriculture, forestry, fisheries and nutrition, covering such aspects as production, processing, trade, prices and consumption;
2. the outlook for production and consumption of foodstuffs, and the study of problems of international trade in agricultural commodities;
3. the collaboration of FAO member countries with other international agencies such as the World Health Organisation, the International Labour Office, United Nations Educational Scientific and Cultural Organisation and United Nations Childrens' Fund, in organizing international action in the fields of agriculture, forestry, fisheries and nutrition;
4. the setting up of a world extension or advisory service in mobilizing modern scientific knowledge to increase production and improve the handling, processing and distribution of food and other products of agriculture, forestry and fisheries.

The maintenance of an intelligence service such as that provided by FAO involves the collection of two kinds of material. The first is mainly economic intelligence data which must be collected annually since the facts are constantly changing. The second concerns technological developments which represent an addition to existing knowledge and is gathered in a variety of ways—from printed publications, questionnaires, meetings of expert consultants and visits of the organization's staff to member countries; it is disseminated in year books, monthly bulletins and abstracts, at meetings and in public announcements, by the press, in films and on the radio, and by the staff in the course of their work.

FAO in collaboration

In its operations FAO does not act on its own initiative. It can only provide specific advice and help to governments on request, and in accordance with their wishes. The preparation and implementation of development plans is the responsibility of national governments and FAO only helps in the formulation of such plans and supplies assistance in their implementation. This involves giving advice and help to governments in determining the objectives to be achieved, in the organization of the necessary administrative and technical services, and in training personnel in the countries concerned to carry out the programmes. In almost every instance the help given to increase the supply of food and other agricultural commodities is based upon the collection of statistical, economic and technical information, which is incorporated into the services which FAO technicians make available to the government officials, local technicians and farmers.

Since FAO was formed twenty-five years ago, its role has changed in emphasis from concentration on studies and advisory work to greater direct involvement in development projects. Examples of this kind of work in agricultural development planning were the Mediterranean Development Project started in 1957 and the Survey of African Development Potentialities in 1961. These, and others, have marked a natural progression towards the fulfilment of FAO's ultimate objective which requires the provision of technical know-how to be backed up by the supply of investment funds and credit facilities. A landmark in the provision of financial as well as technical assistance for agricultural development was the setting up in 1958 of the United Nations Special Fund, in which FAO has become the largest operating agency. More recently in 1964, FAO and the International Bank for Reconstruction and Development concluded an agreement for co-operation in the preparation of agricultural projects qualifying for financial aid from the Bank. In 1965, too, a similar agreement was concluded with the Inter-American Development Bank to assist agricultural development in Latin America.

The increasing direct involvement in the problems of economic development, particularly those relating to agriculture, has confronted FAO with two problems which are possibly more intractable than the provision of technical and financial assistance. The first of these are the institutional problems facing agriculture which are perhaps a greater obstacle to increased productivity than ignorance of modern methods. This has meant providing increasing numbers of experts in the field of land tenure, co-operation, credit and marketing. The second is the problem of world trade in agricul-

ural products which has two important and distinct aspects. One relates to the extreme instability of agricultural prices; the other to their decline relative to industrial prices and the consequent fall in the purchasing power of agricultural exports needed to pay for the industrial imports essential for economic development. In 1964 FAO contributed largely to the preparation of the United Nations Conference on Trade and Development, which focussed attention on these trade problems, and emphasized the multiple links between trade and development.

However, the most significant development in the lifetime of FAO has been the explosive growth of population accompanied by a relatively slow rate of growth of food production in many parts of the world. It has been estimated by FAO that merely to keep pace with the projected increase in population, without any improvement in diets, the world's total food supplies would have to be doubled by the year 2000. The solution to the problem clearly lies in the extraordinary scientific and technological progress that has transformed agriculture in the developed countries and is making its appearance in other parts of the world. The challenge facing FAO is to overcome the financial and institutional barriers to the application of this knowledge to the problem of increasing agricultural production, as part of an overall programme for economic development, but at the same time acknowledging the different cultural environments in which it is operating.

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New Regulations for Cream

New requirements for the description, composition, labelling and advertisement of cream are contained in the Cream Regulations 1970. The Regulations specify minimum fat contents for the various categories of cream (including some new ones) and require the type of heat treatment, if any, to which the cream has been subjected to be shown as part of the description of the cream. Provisions are also made for the sale of cream in aerosol containers. The Regulations permit the addition of sugars and the use of certain additives, in controlled amounts, in specified types of cream.

The new Regulations came into operation on 1st June 1970, except that the requirements relating to products at present covered by the Food Standards (Cream) Order 1951 and sterilised half cream with not less than 18 per cent milk fat will not take effect until 1st March 1972. Copies of the Report may be obtained from H.M. Stationery Office or through *any bookseller price* 1*s.* 9*d.* (by post 2*s.* 1*d.*).

ROYAL SHOW

7th—10th July 1970

AT THE NATIONAL AGRICULTURAL CENTRE,

KENILWORTH, WARWICKSHIRE.

Exhibits by the Ministry of Agriculture, Fisheries and Food

Beef production

THE exhibit staged this year by the Ministry of Agriculture, Fisheries and Food is slanted towards beef production and some of its problems. The 'main roads' to economical beef production in this country are represented in five paddocks on the Ministry site which show calves from upland and lowland suckler herds, pure-bred and beef-cross steers from the dairy herd, and grass-finished stores from Ireland. The housed cattle exhibits include specimens of intensive cereal beef, intensively finished suckler calves and summer finished steers from the dairy herd.

In each case, quantities and cost of feed related to performance data indicate the relative profitability of the various systems.

Marketing of beef

At the end of the road lies the market and the butcher's shop. A further exhibit shows the type of live beast that does and another that does not meet the minimum standards of conformation and fleshing to qualify for guarantee payments under the Fatstock Guarantee Scheme. A side of beef from cattle similar to each of the live animals shows that the eligible animal produces a carcase with a higher proportion of saleable boneless meat and a lower percentage of bone than the rejected animal.

The story is taken a stage further for the consumer. Cookery demonstrations during each day show methods of using the cheaper cuts of beef from the fore-quarter to produce economic but appetising dishes.

Beef housing

The design and cost of buildings is a significant factor in any farming enterprise. The effect of the cost of four types of beef buildings on the profitability of four basic beef systems is shown, underlining the need to consider the economics of beef projects carefully before deciding on a type of building.

Examples of beef housing are also shown, emphasizing that whatever the building—from simple shelter to fully insulated and mechanically ventilated house—the environment produced must provide for the health, welfare and safety of both stock and stockman.

Drainage

An outside exhibit on drainage demonstrates the results of the national drainage survey and points to the continued need for adequate under-drainage and the benefits to be expected in increased yields from well-drained agricultural land.

Farm waste

The Ministry is also present in the Planned Farm Waste Management Demonstration organized by the National Agricultural Centre to show some of the work involved in farm waste disposal problems. In the Poultry Centre, the Ministry's exhibit deals with poultry manure and poultry carcases.

Safety

On a site adjoining No. 1 Entrance the Ministry draws attention to the tractor safety cab. A film shows how thoroughly safety cabs are tested in manufacture and examples are displayed of cabs that have saved lives in tractor accidents. (See also 'Farm Safety' on p. 304).

Grain infestation

Methods of preventing damage to barley and other grain by insects during storage are shown, together with the factors—condensation and heating—that lead to such infestation.

Metrication

Britain is now half-way through the programme for adopting metric units of measurement. Exhibits on the Ministry site and in the Farm Buildings Centre explain the new units and high-light their effect on agriculture and the construction industry.

Horticulture

In the Horticulture Demonstration Area the Ministry shows how plant density and arrangement in the field can affect the size and quality of plant crops, the time of maturity and the spread of the harvest period.

Conservation

In the Country Landowners' Association building, the Ministry provides an exhibit on conservation alongside one by the Nature Conservancy. The Ministry shows how farmers—who are as concerned as anyone about the countryside—can take advantage of modern methods and farm profitably whilst still providing habitat for the wild plants, birds and animals that make the countryside so attractive.

High Mowthorpe EHF have examined various methods of achieving improved work rates in the production of barley; this article outlines various aspects of production costs

Low Cost Barley Production

M. Appleton

BARLEY boomed because the crop could be profitably grown under a wide range of farm conditions. In recent years, however, the costs of production have risen more steeply than returns whilst the margins have fallen.

If barley is to make a worthwhile contribution to farm profits then every effort must be made to cut the production costs without reducing yields. The cost of seeds, fertilizers and sprays have increased, but under most conditions it is the basic costs of labour, machinery and rent which have had the greatest effect.

Additions to existing knowledge and the development of new techniques on various aspects of barley production may provide the opportunity to prevent an increase, if not actually reduce, costs. Techniques which increase the output from each man or machine will help to pay the production cost.

A series of experiments at High Mowthorpe E.H.F. have examined various methods of achieving improved work rates and this article outlines various aspects of production costs through the annual cycle of operations.

Cultivations

Is ploughing really necessary? Seedbed preparation traditionally consists of ploughing during winter followed by two or three cultivations in the spring. Any reduction in the number or any increase in speed of these operations could lead to savings in labour and machinery. In the first year of a trial at High Mowthorpe, dragging (deep cultivation with a fixed tine cultivator) instead of ploughing in winter and two cultivations instead of three before sowing saved both man and tractor hours. This may of course not be possible to the same extent on other soil types or where there is a grass weed problem.

The technique of direct drilling, the ultimate in reduced cultivations, has received a considerable amount of attention in the last five years. The technique may offer some saving in labour and machinery costs, but experience at High Mowthorpe indicates that where it is used for several cereal crops in succession a build up of couch can occur. If the alternative grain drill and cultivation equipment are used on the farm anyway, is the extra investment in a direct drill worth while?

The introduction of machines capable of producing a seedbed from ploughed land, fertilizing and sowing in one operation offer some possible saving in costs. Both direct drilling and single pass techniques will become useful commercially only if high enough rates of work are achieved to ensure that the crop is sown at the optimum time.

Fertilizer

The use of excessive levels of fertilizer is wasteful. There is a considerable amount of information available on fertilizer rates and, together with soil analyses, levels of phosphate and potash higher than necessary can be avoided. With nitrogen, optimum levels vary considerably from farm to farm and from year to year, and experience of the individual farm will suggest the appropriate level.

The advantages of combine drilling seed and fertilizer must be weighed against the higher cost of a combine drill compared to a plain drill. On a big acreage the lower work rate of a combine drill might well mean that all the barley would not be drilled at the optimum time.

Seed

Seed costs may be trimmed in a variety of ways. Savings may be made by using home-grown seed, provided of course it is of a satisfactory quality both in terms of germination and purity. A testing service, provided by the National Institute of Agricultural Botany, is available to farmers.

Varieties recently introduced on to the market are generally more expensive to purchase than the more common varieties. Any increase in yield derived from these varieties must offset the higher seed costs before it is worth while.

An unnecessarily high seed rate is commonly used on an insurance basis. This may not be justified in many cases, for there is considerable experimental evidence that eight or nine stones of seed per acre is sufficient. Levels in

excess of ten stones per acre are normally unnecessary as the barley crop can compensate for a low plant population by increased tillering of individual plants.

Seed dressings of mildewcides are likely to become common in the next few years. Investigational work going on at a number of centres should provide the information necessary to decide whether the extra cost involved will be covered by increased yields. It will depend very much on climate and variety of barley, so it may become useful only in those parts of the country where environmental conditions favour the development of mildew.

Sowing

Work at High Mowthorpe has shown that applying seed with a spinner type fertilizer distributor can be a useful method of speeding up sowing. Work rates of from seven to eight acres per hour have been attained compared with from five to six for a conventional drill and up to four for a combine drill. Yields of crops sown in this manner have compared favourably at High Mowthorpe with those from conventionally drilled crops, but rather less favourably on farms in the East Riding of Yorkshire.

Where a fertilizer distributor is essential on the farm for other purposes its use to sow corn may avoid the renewal or purchase of a specialized corn drill. In addition, the fertilizer distributor has the advantage of being able to work in conditions where normal drilling would be impossible.

As mentioned previously the single pass technique of cultivating, fertilizing and sowing could be useful provided the implements can work under normal soil conditions, at satisfactory speeds and will give yields similar to those obtained from conventionally drilled crops. Investigations are in progress at High Mowthorpe to evaluate this technique.

Weed control

The application of herbicides for weed control is now a routine operation on most farms. But is it an unnecessary routine in many cases? An assessment of the weeds present in each field may show that the less expensive herbicides may be adequate, or indeed that the weed population does not warrant any control measures at all.

Previous crop hygiene will avoid the necessity of using overall dressings of herbicides for wild oat control.

Harvesting

The number and size of combines necessary for any given acreage of corn is the subject of much controversy. One point of view is that combines should be used to the maximum, while another suggests that there should be sufficient reserve in case of bad weather. Perhaps just as important as either of these is the relationship between grain output from the combine and the amount the drier can handle. Obviously the moisture content of the grain and the distance from combine to drier will influence the position to some extent. But corn coming in at a greater rate than that at which it can be satisfactorily dried may lead to managerial difficulties and possibly financial loss if grain spoilage occurs.

THE AUTHOR

M. Appleton, B.Sc.,
High Mowthorpe Experimental Husbandry Farm

Where existing resources cannot cope with an increased acreage, some spread of the harvest can be obtained by using early and late maturing varieties. Consideration must be given to sale direct from the field or drier rather than storage on the farm. Alternatives to drying and bin or floor storage which could reduce costs are the moist storage of grain in sealed towers, chilling, and the application of propionic acid.

The bottleneck often caused by straw disposal must be eliminated either by a well organized bale handling system or possibly by burning the straw. A long-term trial at High Mowthorpe has found no injurious effects of straw burning on an arable rotation.

Conclusions

If all methods of reducing costs could be combined then a true low cost system would be a reality. In most cases other considerations affect the issue and some form of compromise is necessary. The possibility of some operations being done on contract, the hiring or leasing of machinery or the sharing of machinery through a syndicate must also be considered. However the individual farmer views the situation, it should be his aim to keep costs down while maintaining output within the context of good husbandry.

Covent Garden Market Authority

The Minister of Agriculture, Fisheries and Food has renewed the appointments as members of the Covent Garden Market Authority of Mr. J. W. Rodden, C.B.E., Mr. W. J. Tudor and Mr. R. G. E. Jarvis for further terms expiring on 30th June 1973.

The Covent Garden Market Authority has the responsibilities of managing the existing Covent Garden Market and of transferring it to a new site at Nine Elms, the construction of which will start in January 1971.

'Wild Oats'

Wild oat seeds have been known to lie dormant in grassland for up to 40 years, and to germinate after ploughing

Weed Seed Survival

J. L. Jones

NEXT in importance to the insect and bacterial pests which pose a continuous threat to crop growing is the menace of weeds: always ready, it would seem, to colonize and compete and starve out or smother the cultivated species. 'Weeds', as one countryman put it in fatalistic overtones, 'know how to wait'. There is no doubt that the capacity of weed seeds to lie dormant until the trigger of light and/or moisture brings them into active growth is one of the most perfect of Nature's survival mechanisms.

How long can weed seeds survive? This type of subject lends itself ideally to unauthenticated stories. After the seeds of fact and fancy have been sifted, there remains a hard nucleus of fact which proves that weed seeds can germinate after astonishingly long periods.

There is one old chestnut that needs disposing of at the outset. There has never been any truth in the story that cereal seed taken from the burial chambers of the pyramids germinated after 3,000 years of dormancy: a story successfully designed to numb the senses and pick the pockets of generations of gullible tourists.

One of the first British attempts to get some definite information on a subject of interest to all crop growers was made by the British Association in the period 1840–1857. Among a large number of seeds kept in dry storage under controlled conditions were a number of typical field weeds. Regular germination tests were made and it was found that plantain seed failed to germinate after three years, while such species as burdock, wild carrot, ground ivy, sorrel, bladder campion, tufted vetch and fool's parsley lost the power to germinate after eight years.

Survival periods

The ability of weed seeds to survive long periods in soil is still being demonstrated in an experiment which was started in 1897 and is continuing. In that year a botanist, W. J. Beal, collected seeds of many species growing in a part of the United States and separated them into lots of 50 seeds; each lot was placed in deep-dug, moist sand from land that had never been cultivated and buried in an unstoppered bottle pointing downwards in the soil. The bottles have been dug up over the years and the germinations tested. Among many others shepherd's purse has germinated after thirty-five years, lamb's tongue plantain after forty years, and a species of dock after eighty years.

In 1934 the French scientist, Becquerel, germinated seeds of cinnamon flowers which had been gathered and carefully recorded in 1776. A Japanese botanist, Ohga, has reported having germinated seeds of the sacred lotus taken from a peat deposit in Manchuria, the seeds being from 160 to 400 years old.

The capacity of weed seeds to survive over long periods has received confirmation from other authentic sources. An obvious site for collecting seed unlikely to be contaminated accidentally with seed of external or recent origin—one of the real problems in this sort of test—is from under old buildings. Results of a meticulous series of tests with seed from this type of source have been reported by a Danish botanist, Sorël Odum, who collected samples from under old pavements, floors and demolitions, as well as from buildings of known date still standing. He screened the soil for seed and planted the seed in sterile sand. His experiments appear to confirm some fantastic survival powers. Corn spurry and fat hen seed germinated from sites going back to 200 A.D., i.e., the seed was 1,700 years old. Stinging nettle grew from soil covered over originally in 1300 and 1400 A.D.; dandelions and turnip seed from soil covered in 1580 still germinated.

Poppy capsules twenty years old

Poppy seeds still capable of germination after twenty years

Seedlings from permanent pastures

Nearer home at Rothamsted, Dr. Winifred Brenchley did a series of experiments with soil samples from different fields of known history, the soil being carefully removed inch by inch for separate testing. Samples taken from permanent pasture which had been grazed (but not mown) for a very long time yielded small numbers of seedlings of five different grassland plants and of three grasses, mainly from the top inch. Close grazing over a period of years had given few grass species—and no clovers—the chance of ripening and shedding their seed. On the other hand, samples from permanent pasture mown annually but never grazed over a long period produced large numbers of seedlings of twenty typical grassland plants and six grass species; again they were mostly from the top inches of the soil although individual viable seeds appeared down to the stiff clay of the twelfth inch. One-hundred-and-twenty 'Bugle' seedlings grew from the soil of one hole, six inches square.

While these very old-established permanent pastures produced virtually no seedlings of typical arable weeds, samples from a pasture which had been arable fifty-eight years ago did produce large numbers; they could only have been from seeds surviving from the previous arable period and were mostly from the soil samples of the third to the fifth inch. Samples from another field, ten years in grass, produced huge numbers of typically arable weeds, while the biggest weed population by far came from a field in ordinary farm rotation which produced a calculated equivalent of 68 million weeds per acre. Speedwell, scentless mayweed, sandwort and lady's mantle, accounted for over 70 per cent of the total.

The Rothamsted experiments show that the large crops of weeds which often appear in ploughed-up temporary pasture are probably derived principally from seed buried in the soil and not from transported weed seed. They showed that many arable weed seeds will germinate after a soil dormancy of sixty years.

Historically, one of the most dramatic examples of dormant weed seed suddenly flowering occurred in the ravaged fields of Flanders in the first world war. The cultivated fields of peace, shallow-ploughed for years by the French peasants, had known small infestations of poppy. Then the fields were torn and gouged and excavated by the shells of the opposing armies, and the buried poppy seeds lying dormant in the earth were brought to the surface to germinate and spread a fantastic red carpet over the tilth of death.

Understanding the growth and dormancy behaviour of weeds is no academic problem but one of immediate practical concern to the farmer, even in this age of chemical weed control. 'Weeds know how to wait', and the basic factor of successful control is still unremitting vigilance.

The author, **John Llewelyn Jones, B.A.,** is an agricultural journalist who is especially interested in problems of arable farming in Britain.

The Ministry's Publications

Since the list published in the June, 1970, issue of *Agriculture* (p. 284) the following publications have been issued.

MAJOR PUBLICATIONS

OUT OF SERIES

Farm as a Business. Aids to Management No. 6. Labour and Machinery. (Revised) 5*s*. (by post 5*s*. 4*d*.)
(SBN 11 240946 6)

Experimental Horticulture No. 21. (New) 9*s*. 6*d*. (by post 10*s*. 2*d*.)
(SBN 11 240811 7)

MECHANIZATION LEAFLETS

No. 1. Mowers. (Revised) 1*s*. 3*d*. (by post 1*s*. 7*d*.)
(SBN 11 240701 3)

No. 26. Tanker Equipment for Liquid Manure Disposal. (New) 1*s*. 3*d*. (by post 1*s*. 7*d*.)
(SBN 11 240683 1)

FREE ISSUES

ADVISORY LEAFLETS

No. 473. Nosema and Amoeba (Revised)
No. 491. Nematodirus Disease in Lambs (Revised)
No. 547. Strangles in Sugar Beet and Mangels (Revised)

SHORT TERM LEAFLET

No. 102. Heating of Laying Houses (New)

UN-NUMBERED LEAFLET

Field Drainage Grants (Revised)

Priced publications are obtainable from Government Bookshops (Addresses on p. 348) or through any bookseller. Single copies of the free leaflets are obtainable from the Ministry of Agriculture, Fisheries and Food, (Publications), Tolcarne Drive, Pinner, Middx. HA5 2DT.

The author, D. Hemingway of the National Agricultural Advisory Service, discusses the origin, increasing productivity and the future of the

New Zealand Ewe Flock

NEW ZEALAND sheep farming had its beginnings in the South Wairarapa, North Island, in 1844 when the first sheep station was founded at Wharekaka. Since that date, sheep have spread far and wide over the country and the best farms, such as those found in Southland, are carrying up to ten ewes and lambs per acre throughout the year. A total of 60,000,000 sheep thrive on New Zealand's green pastures, outnumbering the human population almost thirty times. By comparison, total sheep numbers in Britain are a mere 26,000,000.

The early settlers took with them the Romney from its native home in Kent, the Lincoln and English Leicester, and other breeds such as the Merino from Australia. The Romney, however, quickly assumed the leading role and today 72 per cent of all sheep are of that breed. It has the rather unique capacity to withstand heavy stocking, to produce four or five crops of lambs on hard hill country and at the same time clipping ten or twelve pounds of wool each year. From the hill country, Romneys are normally drafted on to the easier flat country to produce two crops of fat lambs for export when crossed with a Southdown ram.

Future of the industry

New Zealand is vitally dependent on exports of primary produce for her income and about 90 per cent comes from overseas sales of wool, meat and dairy produce. In all he does, the farmer gets maximum consideration from the government, and in 1963 the Agricultural Development Conference was held to consider the future of the industry so as to meet the needs of the rising population and maintain its standard of living. Targets for increased stock numbers based on ewe equivalents were set at approximately 4 per cent per annum.

	Sheep numbers Totals (thousands)		
	1952	1962	1968
Breeding ewes	22,963	33,945	42,750
Hoggets	8,400	11,313	13,900
Wethers, rams, dry ewes etc.	4,021	3,730	3,900
Total ..	35,384	48,988	60,550

This rapid increase in ewe numbers has not necessarily been accompanied by a corresponding rise in lambing percentages. Certainly, the average is

lower than for most breeds in Britain, varying from 87 to 120 per cent as one moves south from the North Island to the far south of the South Island. Low lambing percentages were due to a variety of reasons. Heavy stocking rates on hard hill country often led to losses in breeding stock and so the scope for selection was reduced. Consequently, some poor types of sheep were being retained for breeding and the Romney began to meet a challenge from other breeds and crosses. The Perendale (Romney cross South Country Cheviot) was bred for hard hill country conditions and to some extent has been successful, having a finer wool than the average Romney and also a slightly higher lambing percentage. Another cross has been the Romney/Border Leicester ewe, now known as the Coopworth, which has become popular in both Islands.

Despite these setbacks, however, one must remember that the Romney will form the basis for any improvement programme in New Zealand because of its numerical importance; recent research developments have promised a big break-through for both stud breeders and commercial flock owners.

Increasing productivity

Ruakura Research Station has worked on the question of increasing productivity from the ewe flock and Mr. G. K. Hight made the following suggestions in a paper presented to the 1968 Ruakura Conference:

1. Twin ewe lambs should be identified early in life, ewes born as twins will rear from 9 to 11 per cent more lambs over their lifetime than those born as singles.
2. Ewe lambs should be reared well to reach 75 lb liveweight by 31st March (this is the onset of mating in New Zealand); they can then be mated to lamb at one-year old and thus give an early indication of future fertility.
3. Liveweight of ewes at mating is very important. Below 90 lb liveweight the number of dry (barren) ewes increases, and for each extra 10 lb increase in liveweight there is a 6 per cent increase in twins born. Dry ewes should be identified and culled out of the flock if at all possible.
4. Ewes should be selected for lack of trouble at lambing time; up to 20 per cent of all lambs born can be lost by weaning time due to difficult lambing, mis-mothering etc.
5. The breeding of good flock rams can also lead to increased productivity; farmers wishing to breed rams should pick out an elite flock of twenty ewes out of twins and put these to a performance tested ram.
6. Another alternative to increase productivity is to use a Romney cross ewe such as the Border Leicester if the country is suitable; this cross is capable of giving from 20 to 40 per cent more lambs than pure Romneys.

Widespread interest was aroused by this work at Ruakura and it has encouraged stud breeders and commercial flock owners to go ahead with improvements in their own flocks, based largely on selection for body weights and twinning ability.

Another organization working on sheep production is the Romney Survey Unit, which was instituted four or five years ago as a co-operative effort by the Romney Marsh Breeders' Association, the New Zealand Meat Board and the Wool Board. The purposes of the survey were to investigate all productive losses in Romney Marsh sheep in New Zealand, from mating until weaning time. The survey has covered both studs and commercial flocks and now over 600,000 sheep are recorded carefully each year. The Unit's work has to some extent confirmed Ruakura results, in that the best ewe hoggets were from fertile ewes which conceived and lambed early. In order to avoid the

inclusion of small late born lambs in the Romney breeding flock many farmers now restrict the period of mating with the Romney ram to 42 days and then use Down rams to mate the remainder of the flock. This Down cross progeny is then sold fat and not introduced into the breeding flock.

Mating and Lambing

After a close study of mating behaviour in the Romney ewe, survey work has indicated that 90 per cent of ewes in a flock are pregnant after thirty-four days of tupping (this is two oestrus cycles) and that the peak period of oestrus is reached after three weeks, when approximately 6 per cent of ewes in the flock will be mated per day. It is suggested that different coloured crayons are used on rams after each seventeen-day period to indicate breeding activity and also time of lambing. Most ewes are set stocked at mating; any movement should be done very quietly and at no time should stress be applied to the sheep. Following mating, ewes should not be handled until they are thirty days pregnant to avoid embryonic loss. After thirty days some reduction in feed intake can take place but three weeks before lambing, for each colour group, feed intake is gradually increased. This allows for the needs of the unborn lamb which makes most of its growth over the last few weeks of pregnancy. Then as lambing approaches ewes can be picked out by their colour group to lamb over a particular seventeen-day period, and they are drafted off from the main flock and set stocked. Following lambing, weaning is normally done at ten to twelve weeks when most of the wether lambs will go fat. Ewe lambs to be used for flock replacements are carried on good clover feed to attain the optimum body weight so that mating can take place in the autumn if necessary.

Co-operative groups

A recent development has seen the formation of one or two large co-operative groups of Romney breeders who are pooling their flock resources

Mustering sheep and lambs at Inglewood, Taranaki, North Island

Romney stud lambs and ewes at Canterbury, South Island

to establish elite flocks of recorded ewes. One group in the North Island consists of 38,000 ewes, and with considerable scope for selection, the aim is to produce high performance rams for sale to commercial flock owners. One well-known Romney breeder in the Wairarapa has been running registered ewes on a hill block entirely unshepherded for several years now. Selecting his older ewes for this purpose on the basis of twinning, free lambing and conformation, he achieved a 150 per cent lambing percentage in Romneys last season.

Type of sheep

British farmers may be surprised at the importance placed on easy care sheep and free lambing but this is a big consideration with the average New Zealand flock now 1,500 ewes. Sheep are never housed in New Zealand and seldom fed concentrates; although the climate is somewhat kinder than in Britain, sudden storms at lambing time can quickly take toll of weak lambs that have resulted from difficult lambings. It now appears that easy lambers, with good mothering ability, are associated with a definite type of character and conformation. These are less blocky than the old type of sheep, with clean open faces (wool on the face is not wanted in the present day Romney), a good high carriage and plenty of room in the hind quarters to allow for a trouble-free lambing.

Summary

Thus it appears that the New Zealand Romney is about to undergo big changes within the framework of the existing National Flock. Hitherto, the exotic sheep breeds have been prevented from entering the country because of disease risks and the lack of adequate quarantine facilities. Breeds such as the Oldenburg and Finnish Landrace have been discussed as sources of improved material for use on the Romney. However, following the work already in existence, stud breeders and research workers have proved that the Romney by careful selection and management can compete successfully with all other breeds in the rather unique New Zealand environment.

The author, **D. Hemingway, B.Sc.**, is a District Agricultural Advisory Officer with the National Agricultural Advisory Service at Durham.

Agricultural Censuses

World Census of Agriculture 1970

EVERY ten years a World Census of Agriculture is held under the auspices of the Food and Agriculture Organization of the United Nations to obtain internationally comparable statistics. Particular emphasis is given to questions on the general structure of agriculture in participating countries—size of farms, tenure, use of land, etc.

In England and Wales (as in other parts of the U.K.) most of the information is taken from the normal agricultural censuses, but with the agreement of the N.F.U., a few new questions have been added to the June and September census forms to meet the special needs of the World Census, and to fill gaps which have existed in this country's own statistics. The extra questions at June relate to *tenure*—acreage *owned or rented*—and to areas of *woodland* and other land used for purposes *ancillary to farming*, e.g., the area under roads, yards and buildings.

There is a further change on the 1970 June census form. In the past *labour* questions have excluded the farmer himself, partners (other than junior working partners), directors and office staff. To obtain fuller information about the total number of people working in agriculture, farmers, partners and directors, and all those engaged in managerial, supervisory or secretarial work—but not the farmer's wife—will be included from this year onwards.

The result, however, should not be that farmers would have to cope with more form filling in future, for the Ministry is at present trying out arrangements which will reduce the number of census returns most farmers are required to complete. The essence of the new system is that holdings would be sampled on the basis of their type of farming—dairying, livestock, pigs and poultry, cropping, horticulture, and mixed—and the size of farm in terms of standard man-days. The complete June census would continue but the sample census held three times a year (March, September and December) would consist of some 30,000 holdings only in place of the holdings in a different one-third of the parishes in England and Wales—about 80,000 holdings each time—which is the present system.

Under the new arrangements, the majority of farmers—about 224,000—would normally complete only one return (June) a year instead of two. The larger size holdings would, however, have to be sampled more heavily than others according to size, so that some would be asked to complete two, others three and the very largest—some 5,000 holdings—four returns a year. Overall it would mean farmers having to complete roughly 150,000 census forms a year less than in the past.

Despite the smaller sample, results are expected to be no less accurate or reliable than before. Indeed, because the new procedure is more flexible and would allow certain particular needs to be met—crop forecasts at March, for example—it should have advantages over the present system. To test the technique, called stratified sampling, it is now running concurrently with the existing method: if all goes well with the present voluntary experiment, the change would become fully effective from March 1971.

36. Pembrokeshire

A. J. B. Ratcliffe

PEMBROKESHIRE is an isolated county on the western seaboard of South Wales, windswept by the Atlantic gales and bounded by the sea on three sides. It enjoys 160 miles of very attractive coastline, and has the land mass of Cardigan and Carmarthen as an eastern back-cloth. It is a county of contrasts: from precipitous cliffs and wide, sandy, surf-swept beaches, to the sheep-grazed Prescelly Mountains and bleak, craggy, volcanic upland tors; from the silent Island of Caldey, rich in ancient craft and home of a strict religious order, to the bustling deep water of Milford Haven, capable of taking the new super oil tankers with, on its shores, highly-automated oil refineries, a power station and light industry. From the rich mixed arable farms on the limestone and sandstone growing early potatoes, bulbs and vegetables with complementary enterprises of milk, beef and turkeys; to the all grass specialized dairy farmer with a stockman's eye for a high performance breeding animal.

Apart from pre-historic and early Christian interests, the present community has been considerably influenced during the last thousand years by the intrusions of man, his customs and ideas; the southern half of the county known paradoxically as Little England beyond Wales—has been visited and settled by Scandinavians, Normans, Flemish, Irish and even the Quakers from Nantucket in Massachusetts who migrated here with their whalers to establish a blubber oil industry to light the oil lamps of London. These invasions have left their mark in history, customs, speech and agriculture; there is a notable difference between these people of the south and those who live in the northern half of the county above the castle line or landsker. Here the people are predominantly Celtic with a pastoral stock farming outlook and a flair for Welsh culture and its way of life.

The county enjoys a mild, equable climate; a rainfall of 35 in. in the coastal areas rises inland to 40–45 in. and to over 60 in. on the upper slopes of the Prescellies. The geology of Pembrokeshire shows a greater diversity of rock type and coastal feature than any other area of Britain, varying from the soft boulder clays—dumped by the Pleistocene ice only 10,000 years ago—to the hard and ancient volcanic rock core of St. David's Peninsula produced in the Pre-Cambrian era more than 600 million years ago. In the south the soils are mostly loams derived from the Old Red Sandstone and Carboniferous Limestone and north of this—and traversing the county—is the no longer

worked tail end of the South Wales Coalfield. The northern part of the county has medium loam soils derived from the old shales; in the north-west some of the southern slopes with volcanic soils are warm enough to produce potatoes at the end of May.

Pembrokeshire is also regarded as a botanist's and ornithologist's paradise with most roadsides showing a pageant of flowers in the spring, whilst on certain cliffs can be found rare sea lavenders and many species of wild orchid. The area can boast of Britain's first bird observatory established at Skokholm Island in the 1930s, and on the off-shore islands can be found puffins, Manx shearwater, gannets and choughs.

Agriculture is the primary industry with the small and medium sized family farms still being the backbone of the county's economy. Gross production is 16 million pounds; 50 per cent of this comes from dairying, which provides a livelihood for 2,341 milk producers who keep between them 59,833 cows. The majority of cows are still milked in cowsheds, but during the last few years there has been a significant rise in the number of cows and in the parlours, cubicles, and usual trappings of self-feed systems. In the favourable climatic areas there is an increase of early-spring-calving herds, outwintered and bail milked.

Pembrokeshire is famous for early potatoes and turkeys and often both enterprises are found on the same farm, as they are complementary for labour, buildings and capital. The early potato industry has changed radically over the last few years; whilst the acreage has remained at 7,000–8,000 acres each year, the number of farmers growing the crop has fallen from 750 in 1966 to 580 in 1969. Sixty-six per cent of the crop is now handled by 22 per cent of the growers. This high cost crop with its high risk market, requires considerable technical competence to produce a satisfactory crop. At least 100 farms are equipped for irrigation for, despite the wet western climate, May and June are often dry and up to two acre-inches of water may be needed. Most of the crop is now planted by machine but, because of the topography, size of field, demand of the market, and the inadequacy of mechanical harvesters, there is still a heavy need for pickers in May and June. A small acreage of vegetables is grown, and this could increase as supermarkets make demands for a continuous and regular supply of graded vegetables. The possibilities of expanding vegetable production are being studied, as well as establishing a processing/packaging factory, which could really help many Pembrokeshire farmers to overcome the marketing problems produced by isolation and long hauls to the main market.

Isolation from the urban areas, the renowned coastline, and the pleasant rural areas is attracting an increasing number of tourists each year. Tourism could well become a secondary cash enterprise on many farms enabling some of the old buildings to be converted into self-service accommodation, whilst the displaced farm enterprise could be accommodated with more appropriate modern equipment in a better situation to the land.

The future prosperity of the county lies with improved communications, and better marketing systems for farm produce, a controlled and complementary development of industry, and a realization that the potential for tourism can be developed but not exploited.

A Beef Cubicle Unit

F. J. Rawlins, *Agricultural Land Service, Northampton*

In May 1969 Mr. J. Beaty and Son of Medbourne Grange Farm, Leicestershire, started building a set of beef cubicles and a silage clamp as an extension of their beef fattening enterprise. Previously they had fattened cattle in the traditional strawyard, but the cost of daily littering and feeding made them decide to try more labour saving methods.

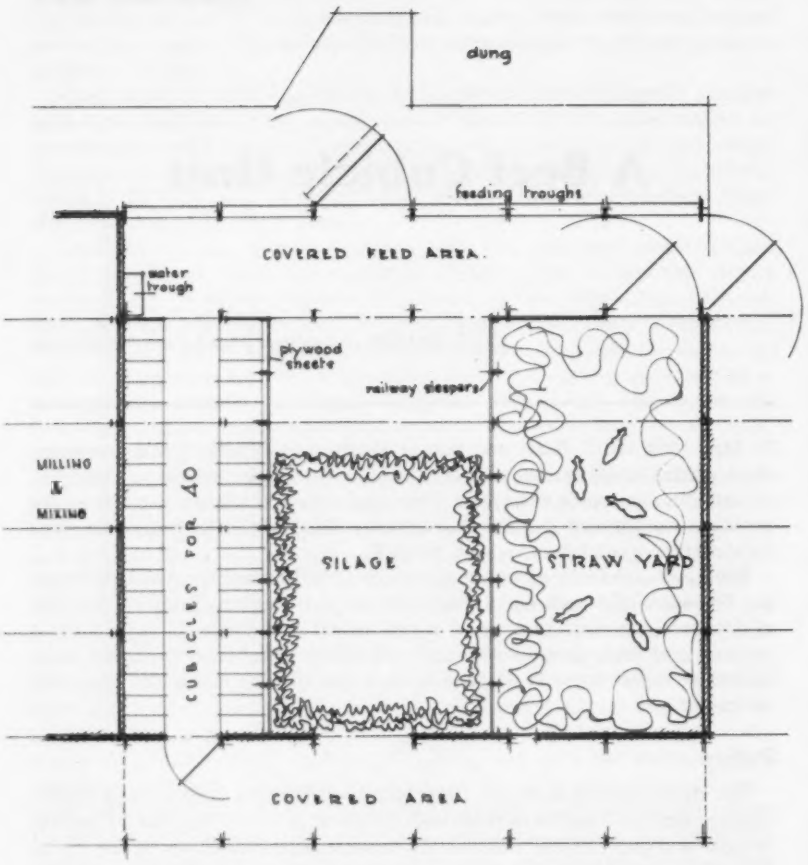
Their 260-acre farm, alongside the Market Harborough-Uppingham Road, has 185 acres of cereals and seventy-five acres of pasture. Stocking is a herd of fifteen nurse cows and up to eighty calves and followers. The farm is exposed and fairly steep, with heavy soil which poaches easily. Stock must be housed under cover in winter and there was already enough covered area to do this.

Policy

Mr. Beaty's policy is to rear forty calves, all Freisian crosses, each winter, running them in bunches of three with the nurse cows (which are all Friesians bought-in cheaply as cull heifers), the numbers being made up by buying-in. The calves spend their first winter in a strawyard and the following summer on the grass. The young cattle then weigh about five cwt and are put into the cubicle unit for their second winter on self-fed silage and a home-produced concentrate ration. By the following spring they will weigh eight cwt and be sold off fat.

Housing

The unit is housed in a building 60 ft long consisting of a 40 ft span Dutch barn with one lean-to of 30 ft and another of 15 ft. Inside is a 60 ft by 30 ft silage clamp, flanked on one side by a strawyard and on the other by a cubicle unit with forty cubicles in two equal rows. There is a 15 ft lean-to along each end of the building: one gives access for the fattening cattle to the silage clamp and has a feed fence for their concentrate ration. The other is used as a sick bay and store for extra hay and straw. Both lean-tos are high enough to allow loaded trailers to pass under them. The clamp holds 200 tons, and the waterproofed plywood panels fastened to sleepers which retain the silage give the sides a good airtight seal.



The cubicles are 6 ft long by 3 ft wide, a size which has proved very successful for beef cattle. At first the headrail was set too high, allowing some soiling of the cubicle bed by the smaller animals, but this has now been corrected. Other works include a concrete road alongside the feed fence leading to a slurry pit of 5,000 cu ft capacity, enough to store for the winter the manure from the forty fattening cattle.

The unit was designed so that it could be expanded to hold up to 100 fatstock by adapting the present strawyard to hold sixty cubicles. The clamp would be extended upwards, to be filled then by blower. Feedings would be from both ends, using the south lean-to as an access passage.

Everyday management

When the unit is in use during the winter, the cows and calves are fed on hay stored over the silage clamp. The forty followers in the cubicles feed *ad lib* on the silage, at an estimated 50/60 lb each per day. This feeding is

controlled by an electrified bar hung in front of the silage face. They are also fed 10 lb a day each of oats, barley and beans, in two feeds.

The cubicle passage and the silage face are cleared of slurry normally twice a week, using a mounted scraper. Cubicle beds, which are of hardcore, are littered with straw at the same time: shavings were tried but they were too easily kicked into the gangway. The time taken for this is three hours weekly, against 1½ hours daily for littering when the same animals were housed on straw.

Costs

The whole scheme cost £1,800, or £1,260 net of grant. Allowing a ten-year life for the clamp, and fifteen years for the rest of the work, the annual charge per head of cattle sold is £4 10*s*. (£4·50).

Summary

A lot of thought has gone into the layout of this small unit to save time on daily routine. Nearly 100 cattle are housed under one roof with their feed conveniently close at hand; this makes for easier and better supervision, and in particular helps the stockman to detect the one beast which is in need of attention.

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books received

Physiological Aspects of crop Yield. Copies from the American Society of Agronomy, Crop Science Society of America, 677 South Segoe Road, Madison, Wisconsin, U.S.A. 1969. $10.50 (£4 5*s*. approx.)

Genetics of the Potato. H. W. Howard. Logos Press, 1970. £3.

The Influence of Management on Tiller Development and Herbage Growth. Ieuan Davies. Welsh Breeding Station, 1969. 10*s*.

Farm Management Handbook 1970. Part I, Standards. Farm Outputs, Inputs and Margins. Universities of Bristol and Exeter. 3*s*.

Re-Use of Waste Water in Germany. Dr. W. J. Müller. Organization for Economic Co-operation and Development. 1969. 11*s*.

Annual Report of Studies in Animal Nutrition and Allied Sciences. Vol. 25. Rowett Research Institute, 1969. 12*s*. 6*d*.

Farm Business Statistics for South East England. Copies from Department of Agricultural Economics, Wye College, Ashford, Kent. 1970. 5*s*. (post free).

Guide to Site Types in Forests of North and Mid-Wales. D. G. Pyatt, D. Harrison and A. S. Ford. Forestry Commission. H.M.S.O., 1969. 8*s*.

Imports and Consumption of Wood Products in the United Kingdom 1950–1967, with Forecasts to 1980. A. J. Grayson. Forestry Commission. H.M.S.O., 1969. 6*s*.

Experiments on Drying and Scaling Close-piled Pine Billets at Thetford. J. R. Aaron and J. J. Pruden. Forestry Commission. H.M.S.O., 1970. 3*s*. 6*d*.

A Comparison of Structural Policies in Agriculture. S. H. Lane. Agricultural Adjustment Unit, University of Newcastle upon Tyne, 1970. 10*s*. (by post 11*s*.).

The Game Conservancy Annual Review 1969/70. Copies from The Game Conservancy, Fordingbridge, Hants. 7*s*. 6*d*. (post free).

Animal Production. Vol. 12 Part 2. Journal of the British Society of Animal Production. Oliver and Boyd, 1970. 25*s*.

in brief

- **Dairy industry in transition**
- **Beef calves on clean pasture**
- **When men and machines are combined**

Dairy industry in transition

PRESCRIBING for the future is not yet one of our technological innovations. In default, we look to the economists to measure the force and direction of the winds of change, evaluate trends and assess possible consequences. An excellent case in point is the probing examination into the future of that enormous complex comprising our dairy industry* by the University of Newcastle's Agricultural Adjustment Unit. Throughout the length of the long chain that brings milk from our scattered dairy herds to the doorstep, and butter, cheese and cartoned milk products to the retail shop counter, new economic and social factors inject problems that have not only to be solved but, most importantly, anticipated.

By 1975, says the Report, and assuming the rate of growth of demand and supply to be in line with past experience, the U.K. consumption of milk and dairy products may rise to about 400 million gallons of milk equivalent over the 1968 level of some 5,700 million gallons. But technical developments, policy changes, the contraction and expansion of individual segments of the market responding to consumer choice, and the effect of other imponderables are factors which have constantly to be kept in mind. The proportions of milk going to the liquid market and for manufacturing, and the price differentiation incurred, are of supreme importance to the dairy farmer. Preserved milk, whether because it becomes more convenient or more competitively priced, has to be seen as a direct threat to the conventional liquid market. Wider institutional catering would certainly boost the demand for skim milk powder, and the domestic use of 'instant' skim powder, although not yet making a great impact on the market, is increasing. The same could apply to 'filled' and synthetic milks if the price is right and the product is of good keeping quality. A readily soluble whole-milk powder, if developed, would be an even stronger challenge by reason of its easy storage. We have seen an astonishing rise in the consumption of fresh cream during the last few years, and now that an increasing number of people are finding fruit-flavoured yogurt (produced mainly from skimmed milk) to their taste, it is reasonable to expect that this too may have repercussions on the traditional milk market.

An interesting point made by the Report is the likely effect of metrication on the daily pinta. If the pint (568 ml) were to be changed to the half litre (500 ml), liquid sales could fall by up to ten per cent since, from experience abroad, it has been shown that most housewives would continue to buy the same number of bottles as before. If, however, the standard size of bottle became, say, 600 ml, sales might well go up. With less bread being eaten, stronger competition from improved margarines and self-imposed restriction on fat intake by the dietetically conscious, butter could become a hard sell. The public's taste for cheese seems to be growing,

*Economic Aspects of the Dairy Manufacturing Industry, price 10s. (by post 11s.) from the University of Newcastle upon Tyne.

although we eat less than our continental neighbours; and the consumption of cottage cheese, in particular, is rising in the market charts—another indication, no doubt, of the influence of the weight-watchers.

After a long history of traditional methods and products, functioning merely as a subsidiary to the liquid milk market, the dairy manufacturing industry has leapt ahead in the modern technological world with exciting innovations matched by a high degree of productivity. The dairy industry is, to quote the Report, 'in an interesting stage of transition'. Producer, manufacturer, consumer and taxpayer are all involved in the new possibilities being opened up. An estimated U.K. population of 58 million by 1975 should automatically enlarge the market for both liquid milk and dairy products, but what will be the social and dietary patterns then prevailing can only be guessed.

Beef calves on clean pasture

UNTHRIFTINESS of young beef animals in the second half of the grazing season may be due to any one or more of a number of reasons, but on many farms intestinal trichostrongylid worms may be the root cause. By July, a level of infective larvae can be built up in the sward, which rotational grazing does nothing to prevent. Following the work of J. F. Michel, of the Central Veterinary Laboratory, and recent trials at several of the Ministry's Experimental Husbandry Farms, a brighter prospect is presented by moving the animals on to clean aftermath grass in mid-July and giving them an anthelmintic dose at the same time. Other methods of grazing management which demand no anthelmintic treatment are, of course, also available.

When men and machines are combined

IN terms of productivity and, by definition, the viability of any farming enterprise, the reciprocal economic action of farm labour and farm machinery and equipment continues to gather more and more importance as the labour force continues to decline. The past ten years have been marked by an unprecedented rate of loss in the farm labour force and a correspondingly sharp increase in the rate of wages. Taking the figures for the period 1957–66 quoted in the Ministry's new edition of *Aids to Management No. 6: Labour and Machinery*,* the total number of regular, full-time workers engaged in agriculture fell to 153,000, a reduction of 34 per cent, whilst the basic wage for an adult male worker increased by 60*s.* (40 per cent). Within the concept of the National Plan it was expected that the outflow of agricultural labour in the United Kingdom to other industries between 1965 and 1970 would be of the order of 142,000—some 2·8 per cent a year.

It is apparent, therefore, that in these circumstances, which are likely to continue, efficiency in the combination of labour and machinery is of the utmost importance. In 1966–67 the cost of labour and machinery combined is estimated to have accounted for no less than 36 per cent of total farming expenses; on mainly arable farms it may be as much as over one-half. Obviously, a number of factors reflecting the nature of the enterprise, the kind of equipment available, type of soil, etc. must be taken into consideration as determining the optimum form of organization in individual cases. By method study and work measurement, which sound more fearsome than in fact they are, the average farmer may be able to define more accurately where the highest potential of labour and machinery combinations lie; and the publication mentioned above should certainly prove very helpful. It is rather like the old kaleidoscopes we used to have as children. By shaking them up, getting a completely different pattern of combination was an interesting exercise.

AGRIC.

*price 5*s.* (5*s.* 4*d.* by post) from H.M. Stationery Office. (addresses on p. 348).

Books

An Introduction to Plant Diseases. B. E. J. WHEELER. John Wiley and Sons, 1969. 65*s*. [£3·25].

This book is based on lectures to students studying plant pathology for the first time and can conveniently be considered as a series of essays on diseases of both temperate and tropical crops.

The author deals mainly with fungi, bacteria and viruses, but includes some nematodes, some insects and mites, a few flowering plants (such as broomrape) and mineral deficiencies. He avoids the usual methods of approaching the subject according to the natural order of the pathogen or the crop attacked, and prefers a rather arbitrary grouping based on the type of disease. A selection of chapter headings will give an idea of this: damping-off and seedling blights, roots and foot rots, wilts, powdery mildews, rusts, smuts, leaf spots, galls, mosaics and yellows. The last few chapters deal briefly with such general subjects as disease assessment and various methods of control.

The book is thus not intended for, and is not likely to be of value to, farmers or general advisers in this country except, perhaps, as background information for those with a special interest in plant disease.

There is much to be said for broadening the spectrum of the single discipline plant pathologist but I feel it might have been better to have dealt more thoroughly with certain aspects either by restricting the range or increasing the size of the book. Pests seem to be included either as disease vectors or because they cause similar symptoms to a fungus but there are, inevitably, many omissions. I failed to find mention of turnip gall weevil which causes damage superficially resembling club root, or to cyst nematodes which are commonly thought of as causing soil sickness and may be associated with certain fungus diseases.

Despite these limitations and the unusual arrangement the book is readable, interesting, well illustrated and documented. A student in search of information to supplement a more academic study of pathogens should find it a helpful guide to the literature and the wider applications of the subject.

H.C.G.

Monks Wood Experimental Station Report for 1966-68. Nature Conservancy, Natural Environment Research Council, 1969. 10*s*. [50p].

In 1961 the Director of this station took up office in a temporary hut, the nucleus of a new centre for the study of scientific methods of conservation. In 1968 he directed the largest aggregation of ecologists in this country, housed in buildings which included in addition to the normal laboratories, libraries and offices such refinements as an insectary and an underground wormery. The names of the Station's main divisions, Toxic Chemicals and Wildlife, Lowland Grassland and Grass Heath, Woodland Management and Biological Records, give an indication of the scope of its work. This report, concluding with a list of over two hundred station and staff publications, gives more than an indication of the manner in which it fulfils its task.

The list of projects is long and varied. All concern the farmer, for it is primarily through him that human action influences the organic complex we call the countryside. They also concern the rest of us, for it is the demands of society that ultimately shape the ecological pattern of field and woodland, upland and lowland. Studies of the effects of new villages on local nature, of different types of management on different types of grassland, of paraquat on aquatic weeds, of low hedges which allow rats to raid nests for eggs on bird population, and of cutting coppice-with-standard woodlands on the indigenous insect communities; these are but random examples of the evidence being systematically collected on the ecological consequences of man. The sections on the effects of pesticides on wildlife and, for example, the heartening story of the recovery of the Golden Eagle, the most magnificent of British birds, after the banning of dieldrin sheep dips, remind us of the importance of such work.

The report is admirably produced and lucidly written in layman's language, as befits a centre which is concerned with education and advice as well as its main function of research. It is pleasant to note that the list of organizations with which the station co-operates includes the N.A.A.S.

N.H.

Farm Machinery. CLAUDE CULPIN. Crosby Lockwood, 1969. 63*s*. [£3·15].

This book on farm machinery has been regarded as a standard text-book by farmers and students of agriculture for many years. The publication of the eighth edition is well timed because there has been much progress in farm mechanization and improvement in the design of machinery since the book was last revised. The text has been re-arranged and new chapters added, so that the material has been brought up to date.

As in previous editions, the emphasis is on basic principles and general descriptions of machines rather than details of construction. The author discusses the changing views on farming methods and gives the basic design and performance of the machinery available for them.

The new chapter on silage-making and feeding puts the mechanization of silage into perspective. The numerous current techniques are explained, together with a description of the appropriate equipment for each of them. What is even more important, the relationship between method of storage and mechanical feeding is given.

A new chapter on equipment for livestock husbandry describes the latest labour-saving methods for handling materials other than forage crops used in livestock management. The equipment described includes vehicles for bulk delivery, various types of conveyor, and liquid feeding. The methods cover cattle, pigs and poultry and in many cases the plant embraces automatic devices.

The up-to-date information on environmental control deals with the automatic control of temperature, ventilation and carbon dioxide content in commercial greenhouses and horticultural stores. The heating and ventilation of buildings used for livestock is well covered; there are tables giving the desirable minimum temperatures, the ventilation rates and heat input per head for various types of stock. Systems of controlled heating and ventilation are also given.

As with previous editions, the numerous well-selected photographs are excellently reproduced and the diagrams are very clear. The new edition is strongly recommended to all farmers, in fact, to anyone interested in agricultural machinery. Those in possession of a previous edition should not hesitate to get up to date.

W.H.C.

Farm Practice. The Student's Information and Records Guide. Edited by E. F. THORPE. Crosby Lockwood, 1969. 25*s*. 6*d*. [£1·27½].

The keeping of a farm diary is the first step in the farming student's education. This has been so for many years and most colleges, institutes and other agricultural education centres require this evidence of pre-institutional training in practical farming before the student embarks on a formal course. All too often, this diary has been a sketchily assembled amalgam of unrelated facts, prepared with the minimum of guidance to fulfil a compulsory requirement.

With this in mind, the staff of Seale-Hayne Agricultural College have designed a format, the use of which makes the farm diary a vital link in training and enables the student to assimilate information on every facet of farm work, providing him with a library of 'on the farm' information which can form the basis for more academic studies.

The manual is laid out to provide a full record of the trainee's farm, its topography, soil type, climate, stocking, cropping and the buildings and other fixed equipment which it contains. Provision is made for an individual field record of crops, cultivation, manuring, etc., and a month-by-month programme for each livestock enterprise. Coming from Seale-Hayne, one would expect a strong farm management orientation and the record guide provides this through enterprise data forms covering the financial as well as the physical factors involved. The comparison figures given enable the student to assess the level of performance on his farm against accepted standards.

Mr. Thorpe and the staff at the college are to be congratulated on providing the means whereby the farm diary ceases to be the agricultural student's prime chore and becomes a vital and interesting part of his early training, supplying him with both method and fact for his later work.

Although aimed primarily at the initiate student, the guide can be equally recommended to the practical farmer who is looking for a simple way of recording the important features of the farm year and using such records to attain improved efficiency. It concludes with a short library list of recommended books which completes this excellent practical exercise by encouraging further study.

G.H.B.

Agricultural Chemicals Approval Scheme

Fifth List of Additions to the 1970 List of Approved Products for Farmers and Growers.

NEW CHEMICALS

MANGANESE and ZINC DITHIOCARBAMATE COMPLEX
A fungicide for control of apple and pear scab and leaf spot and rust of blackcurrant
Wettable Powders
Carmazine—Bugges

NEW APPROVED USES OF APPROVED CHEMICALS

DICHLOFLUANID
Now approved for the control of tulip fire

MALEIC HYDRAZIDE
A formulation has been approved for the control of suckering of trees
Liquid Formulations
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Liquid Formulations
Triumph-D Soil Fumigant—Le Sueur

FENTIN ACETATE with MANEB
Wettable Powders
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Company Information

The following firm has recently joined the Agricultural Chemicals Approval Scheme:

John Le Sueur & Co. Ltd.,
Les Ruettes
Haute Croix
St John
Jersey
Channel Islands
Tel: Jersey North 333 & 1150

Eleventh List of Additions to Supplement No. 1 of "Chemicals for the Gardener"

MURPHY SYSTEMIC INSECTICIDE—Murphy
Based on dimethoate for control of greenfly blackfly, red spider mite and many other pests.

ACKNOWLEDGMENT OF PHOTOGRAPHS

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